THE AMERICAN GAS LIGHT JOURNAL

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LXII.—No. 8. Whole No. 1,029. | NEW YORK, MONDAY, FEBRUARY 25, 1895. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. H. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, New York.

Terms of Subscription, Including Postage—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Remittances should be made either by post office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Eleventh Annual Meeting, Ohio Gas Light Association.

OFFICE OF THE SECRETARY, COLUMBUS, O., February 1, 1895.

To the Members of the Ohio Gas Light Association: The eleventh annual meeting of this Association will be held in the parlors of the Arcade Hotel, Springfield, O., March 20th and 21st, 1895; and it is hoped that every member will be present and take an active part in the meeting.

A list of papers to be read will be announced later.

A. P. LATHROP, Secretary.

BRIEFLY TOLD.

MR. LEVI STEVENS SAYS HE WAS ASSAULTED.—In our issue for Feb. 4th we had occasion to comment on the evidence put out by Mr. Gruber, of the New Jersey Legislature, in support of his bill to create the compulsory rate for gas of $1 per 1,000 cubic feet in certain cities of New Jersey, and in that comment we referred to certain "expert testimony" submitted by Mr. Gruber in support of his position, which evidence had been prepared by Mr. Levi Stevens. It is true that we differed with Mr. Gruber, and with "expert" Stevens as well, over the reliability of their statements, but paid greater attention to Stevens than to his principal, for while Gruber's errors and misstatements could possibly be explained on the basis of his entire ignorance of the practical side of the business of gas companies, not so with Stevens, who proudly claims the right and title of gas expert. We did not believe that Mr. Stevens would be at all pleased with what we said, nor did it please us to have to say it, as we prefer to get along peaceably with our contemporaries; yet duty often imposes disagreeable terms, and we merely considered the whole thing in its relation to the industry which it is our privilege to uphold in so far as that lies in our power. In proof of Mr. Stevens' displeasure we submit the following letter, the postmark on the envelope of which proves that it was mailed from Trenton, N. J., on the afternoon of the 15th inst.:

To the Editor AMERICAN GAS LIGHT JOURNAL: The JOURNAL of Feb. 4th and 11th does me a great injustice. Whoever furnished you the material for those assaults misrepresented the facts. First, it is not the Gruber-Stevens bill. I had nothing to do with it until I was dragged into the discussion by Kelsey in self-defence. I have not given figures of what we can do, or what we claim. All the figures given (not what have been reported) are figures given by others in actual practice. As for being a crank, every man who takes a step in advance of established custom is always a crank. My crankiness for years has consisted in my firm belief that a large percentage of the 790,000 heat units lost out of the 1,340,000 in the material (coal and oil) required to make a thousand cubic feet of carbureted water gas could be conserved and utilized. After many struggles and many defeats we (myself and son) have succeeded in perfecting a mechanical adjustment that accomplishes what I have been working many years to attain, and intelligent people would naturally suppose that years of application to attain so valuable an end ought to receive something better at your hands. The statement that our patents had been examined, and the Stevens' process peddled from Maine to the Ohio river, is simply childish. Our patents or applications for our present method are being examined at the Patent Office. One was allowed last week. Securing the prison gas works two years ago gave us an opportunity to apply and perfect our methods which had been denied us elsewhere. As a fair, progressive JOURNAL we trust you will give this as prominent a place as you did the attack on us.—LEVI STEVENS & SON.

We understand, of course, that this is giving Mr. Stevens a considerable amount of free advertising—he knows that we refused some years ago to advertise him at all, because we did not believe either in him or his methods—and he is welcome to it all. We also are satisfied that his screed has been put in as prominent a place as was our "attack" on

him. With that understanding we beg leave to say to Mr. Stevens that he likely will not admire our issue for February 18th any more than he did those of the 11th and 4th, for last week we reprinted Mr. Kelsey's argument in opposition to the Gruber gas bill, before the Committee on Municipal Corporations, which had the measure in custody. Our readers have had plenty of time to think the thing over, and we will leave it to their judgment as to who is the more worthy of credence—Mr. Stevens or Mr. Kelsey. By the way, the gentleman from Trenton in his letter to us just calls the Secretary of State of New Jersey "Kelsey"—no Mr. or other prefix having been used. We have nothing to take back in connection with what we said about this matter, and what we said is true. So far as his statement "I had nothing to do with it until I was dragged into the discussion by Kelsey" goes, we have only to refer to the daily papers of New Jersey and New York for the last week in January and the first two weeks in February in proof that Mr. Stevens enjoyed immensely the field of discussion over which he was being dragged. Slender, indeed, was the chain which dragged him. As to the value of the Stevens process, respecting its operation in the State Prison at Trenton, where it has had full swing, and its promoter as well, for considerably more than a year, we merely submit the following excerpt from the report for 1894 of the Supervisor of the State Prison—Mr. E. J. Anderson. The Supervisor says: "The arrangements for lighting the Prison are exceedingly defective, and at the same time inordinately expensive. Under a contract entered into in April, 1894, the Prison is furnished with gas by a Company which has the privilege of the Prison gas plant wherein to make the gas, which is furnished to the Prison at $1 per 1,000 feet. The principal keeper reports to me that the gas is of very inferior quality, and that occasionally the supply fails and leaves the Prison in darkness; but notwithstanding these drawbacks the sum paid to the contractors during the past year was $5,578.56. At 5 per centum this annual outlay represents a capital of $111,571." This is the testimony of those who have to pay the piper, and it would also go to show that Stevens & Son are right in the assertion that "securing the Prison gas works two years ago gave us an opportunity to apply and perfect our methods."

THE PROPOSED ASSOCIATION OF LIGHTING COMPANIES FOR TEXAS.—Mr. W. E. Holmes, who is very much interested in the development of the plan to form an Association of Lighting Companies for Texas, and whose original mention of the project appeared in the JOURNAL for January 21st, 1895, forwards the following:

AUSTIN GAS LIGHT AND COAL COMPANY,
AUSTIN, TEX., February 15th, 1895.

To the Editor AMERICAN GAS LIGHT JOURNAL: The interest manifested by the Texas gas and electric men in an organization is very encouraging indeed. They respond heartily on all sides, and I am now (on account of a disabled eye) considerably behind with my correspondence, but hope to catch up in a short time. Indications are that when the meeting is called to order we will have by far the strongest (in brains as well as numbers) and most representative body of men ever assembled for a like purpose in this State. Kindly say through your JOURNAL that the movement is going ahead all right, and that as soon as we have heard from all the managers and superintendents, a date and place of meeting will be agreed upon. Also, that we all extend a hearty and earnest invitation to each and every manager, or superintendent, or other officer of a gas or electric company in this State, not only to meet with us to organize an Association, but to write at earliest convenience saying what date and place they think most convenient for a meeting. We have already heard from most of the larger Companies and many of the smaller ones, but want to reach every one if possible. Yours very truly, W. E. HOLMES.

WE regret to announce the death, on the 16th inst., of Mr. William Tarbell, formerly in charge of the Waltham (Mass.) gas works. The funeral ceremonies were celebrated at Waltham, on the afternoon of the 19th inst.

NOTES.—Mr. Percy R. Pyne, a Director in the New York Consolidated Gas Company, died in Rome, Italy, on the 14th inst. He was in his 75th year, was born in England, and came to this country in 1835. He was a son-in-law of the late Moses Taylor. A widow and three children survive.——Mr. Henry D. Polhemus, formerly very prominent in the management of the old Brooklyn Gas Company, died on the 14th inst. He was in his 65th year.——The Vancouver Electric Light Company offers to maintain 175 public arc lamps in Nanaimo, B. C., at the rate of 31½ cents per lamp per night, on the basis of a contract to last seven years.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONTINUED FROM PAGE 221.]

TWENTY-FIFTH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD AT THE PARKER HOUSE, BOSTON, MASS., FEB. 13 AND 14, 1895.

FIRST DAY—MORNING SESSION.

LETTERS OF REGRET.

The Secretary read letters from the following named gentlemen, regretting their inability to attend the meeting: Fred. Egner, D. H. Geggie, G. G. Ramsdell, W. H. Pearson, F. Mayer, E. C. Brown, W. H. White, E. L. Bartlett, T. J. Hayward, A. W. Littleton, A. Hickenlooper, S. M. Highlands, T. G. Lansden and W. H. Odiorne. The President said he was happy to know that all the gentlemen invited did not decline, since he saw many present in the room to whom invitations had been sent. He welcomed them most cordially and hoped they would all participate in the discussions.

REPORT OF THE SECRETARY AND TREASURER.

Receipts.

Balances from last report		$169 04
Receipts from dues, banquet tickets, admission fees		666 00
Total		$835 04

Expenditures.

J. R. Whipple & Co	$360 90	
Printing	57 00	
Salary of Secretary and Treasurer	200 00	
Sundry expenses	76 69	
Balance on hand	140 45	
Total		$835 04
Deposit in Derby Savings Bank		551 87

Audited and found correct. C. D. SHERMAN, C. D. LAMSON, } Committee.

The President, on motion of Mr. Neal, appointed the following committee to nominate officers for the coming year: H. A. Allyn, R. B. Taber, H. B. Leach, William Anderson and W. F. Thayer.

The President announced that Mr. Lamson, of Worcester, would read a paper, entitled "A Cubic Foot of Gas," but that the author declined to have it printed in the proceedings, on the ground that it was reminiscent in nature and intended merely to be a paper for the occasion of the 25th anniversary of the Association. The reading of the paper was followed by a short discussion, which was participated in by Messrs. Neal, Sherman, Addicks, Taber and Wood, after which a vote of thanks was passed to Mr. Lamson.

SOME REMARKS BY COL. ARMINGTON.

Mr. Slater—In your address, Mr. President, the Old Guard was not referred to. There are very few of the Old Guard left, yet as we look around the hall we see among the new faces the faces of some who were present when this Association was organized. We have with us to-day the Father of the Association, and I ask him to stand up and be introduced to the Association. I refer to Col. Armington. (Applause.)

The President—I am sure we all agree that it will be very pleasant to hear Col. Armington.

Col. Armington—Mr. President and gentlemen of the New England Association of Gas Engineers. I assure you it gives me very great pleasure to be here and to say something. While sitting here it has occurred to me that were it not for a few faces I see before me, I should feel that I was in the wrong place. Several years ago, when I attended the Association meetings, once in a while I saw some people whose hair was white or gray, but as I look over this audience, and see all these dark haired men, with young faces, it seems to me as if I were somewhat out of place. We were no doubt very crude in our ideas with regard to carrying on the gas business in those early days, and at the time of the formation of this Association, but I am very glad to see (I read every number of the AMERICAN GAS LIGHT JOURNAL as it comes to me) how things are now progressing, and what men are engaged in, and what their ideas are in carrying these matters out to a successful issue. Of course, in those early days we had no electricity to contend with, and, in fact, we knew very little about it. So far as I can see, or so far as I can learn by reading and from hearing others talk, I do not think electricity is very much of a competitor in the gas business. I do not see how it is possible for it to become a competitor, when we know that it is impossible for them to furnish over 8 lights from a horse power, and we know that they must get that power second

hand. I do not see, therefore, how their light can be afforded at 16 or 20 candles at a price that will compete with gas. I want to say, further, in reply to my friend Slater's allusion to this being the first Association of its kind in this country, I think there can be no question about that. Our friend Slater, as we all know, is constantly delving and digging in the effort to discover what he can with regard to this business; and he informed me he finds that there was at one time an Association of gentlemen prior to our organization, but that they were not gas engineers—simply a body of men who got together in order to protect themselves from the innovations which have become so common in these days. They were not men associated together for the manufacture of gas, but simply for purposes of protection. I think I am right in that statement. [Mr. Slater—That is right.] When this Association was formed we had very different ideas about it. You all well know the circumstances under which it was formed; that after we had returned from the funeral of our old friend, James B. Blake, General Manager of the Worcester Gas Company, a committee was appointed, who, after some deliberation, started this Association on its journey. Those present then were: J. H. Armington, Geo. D. Cabot, F. H. Coggeshall, O. E. Cushing, Dr. Davenport, Geo. Dwight, W. W. Greenough, Geo. B. Neal and Abraham Taber. We all know that its growth has been such that the papers which have been read here, and the discussions which have been had upon them, have not only been quoted in our own country but in other countries as well. Some of the ideas set forth here have been combated by the engineers of other countries, but time has brought us all to the adoption of ideas which they claimed at the time were erroneous. A very singular circumstance has come to my knowledge within a short time with regard to some of our early meetings in this city. After the melancholy event which deprived us of our friend Stiness, Mrs. Cushing, the widow of one of our early members, wrote me and enclosed a leaf from the diary of her husband, written in February, 1871. I had previously written to her and asked for any information that she could give me from her husband's papers. She had destroyed a great many that would probably have been of some service to us. But in this diary, under date of February 3, 1871, he wrote: "In Boston to-day, at the office of the Boston Gas Light Company, assisting in the organization of the New England Association of Gas Engineers." There he stops, but like some of us, perhaps, in those times, and like a great many in these times, there was an after-clap. Further down in his diary he says, "Dined at Parker's." And then he gives the names of those who dined with him. I only see one gentleman present besides myself whose name is written there. Then, at the close of that paragraph, there comes a blank, in which he says, "Also Mr. ——, of Pawtucket, R. I." I remember very distinctly inviting our friend Stiness to come here with me, but as he was a new man among us, our friend Cushing probably did not get his name, hence the blank. It gives me very great pleasure to be here, and to see all of you gentlemen who are engaged in this business which many of us have followed for a livelihood for so many years. (Applause.)

Memorial Resolutions, Samuel G. Stiness.

The President—As stated in my address, I took the liberty of appointing a committee, consisting of Col. Armington, Mr. Sherman and Mr. Prichard, to prepare resolutions in connection with the death of our brother, Samuel G. Stiness. If you will now give your attention, Col. Armington will read the resolutions which have been prepared.

Col. Armington—When you requested me, Mr. President, to form one of the Committee for this purpose, I did so with rather a melancholy sort of pleasure. There have been so many obituaries written upon the deaths of our friends that it would seem as if the English language had about been exhausted. I am not a panegyrist, and therefore do not believe that any obituary I might write, except saying that he was an honest man, would add much to what has been already written. However, the committee have prepared the following:

Samuel G. Stiness, a member of the New England Association of Gas Engineers, was killed by a train of cars on the New York, New Haven and Hartford Railroad at Pawtucket, R. I., on the 5th day of November, 1894.

The sudden and terrible death of our friend shocked the entire community where he resided, the members of this Association, and his many friends throughout the country.

Mr. Stiness was well known by the many persons engaged in the gas and electric lighting business, as well as by the large number of persons who are both directly and indirectly connected with these great industries. To us, who were so intimately associated with him, and to those with whom he had business relations—in fact, to every one whom he knew—his relations were characterized by extreme courtesy, but with a firmness which was unmistakable. His position as General Manager of the Company he served furnished the opportunity for the display of his skill, his powers of invention, and the high executive ability necessary for the successful manner in which he conducted the ever increasing business of the Company, to the satisfaction and profit of its shareholders. The progress and prosperity of the Company which had his services were ever in his mind; his efforts were constantly directed towards better results, greater economy and a higher efficiency of management. That his labors had produced, in a great degree, the results he aimed at, we are assured of by his business associates; and those of us who are familiar with his well equipped, well arranged and well kept establishment can testify to his executive ability as a manager. The subject of the above sketch was born in Douglass, Mass., in September, 1829, and died in November, 1894.

During his early manhood he was engaged in the manufacture of jewelry at Providence, R. I. He entered the employ of the Providence Gas Company, at Providence, R.I., in 1864, and during his term of service with that Company faithfully performed all the duties of his position, to the entire satisfaction of all concerned.

He entered the employ of the Pawtucket Gas Company, Pawtucket, R. I., in 1869, having accepted the position of Superintendent tendered him by the Directors of that Company, and remained in their service until his sudden death.

Mr. Stiness assisted in the formation of the New England Association of Gas Engineers, at Boston, Mass., Feb. 2, 1871, and served faithfully in the various offices, including the Presidency of this, the first Association of Gas Engineers in this country.

The roll of the American Society of Gas Engineers contains his name, and at the time of his death he was its Third Vice-President.

Mr. Stiness was elected a member of the Society of Gas Lighting, of the city of New York, in 1878, soon after the formation of that Society, and remained a member during his life.

During the year 1880 certain of the gas engineers of New England formed an Association, with headquarters in Boston, Mass. Our late friend was one of the moving spirits in establishing this Society, and your Committee are informed gave it the name of the Guild of Gas Managers.

Other Associations of which our late friend was a member held him in high esteem, and were benefited by his experience and wisdom, while his welcome and cheery presence always gave pleasure to his many associates.

It is doubtful if there is anyone engaged in producing light by gas or electricity to whom it gave more pleasure to communicate his experience, explain his method of manufacture, and display his well-kept apparatus for producing the same than our departed friend; the same is also true concerning his readiness to oblige and inform all his associates in regard to the principles and aims of the various societies with which he was connected.

Notwithstanding the many duties which our late friend was called upon to perform, and the great business cares resting upon him, he found time to enjoy the delights of his home, surrounded by his family.

We may not pass the threshold of our late friend's home to say aught of its happenings, but the expressions of love and honor of a loving wife, the respect and fondness of his children for their parents, are all that is needed to show us of the peace and happiness that prevailed therein.

The death of such a man, who has born the heat and burden of life's labor, and left behind him such a record, makes it our duty to honor his memory, and furnishes an example to the living that theirs should be a virtuous and useful life, having always in mind that "A good name is better than great riches."

Respectfully submitted,

James H. Armington,
F. C. Sherman,
C. F. Prichard,
} Committee.

The President—Is it your pleasure that this minute and resolution shall be inscribed on our minutes, and a copy sent to the family of our brother? (Moved by Mr. Wood, seconded by Mr. Neal, and adopted by a rising vote.)

The Association then took a recess until 2:30 P.M.

First Day—Afternoon Session.

The Association met at 2:30 P.M.

The President—The first matter to be taken up for discussion is the topic, "What is the Best Course to Pursue when a Person is Overcome

by Gas Inhalation?" On this subject a number of gentlemen have promised to speak. Is Mr. Lamson in the room?

Mr. Lamson—I do not really feel fitted to speak on this subject. The Secretary wrote and asked me if I would say something, but I merely agreed I would speak on it in order to draw out our friend Dr. Amory, who is, I know, ably fitted to discuss it—more so, probably, than any other one person. This question came up at a gathering of gas men a month or six weeks ago, and it struck everyone present as being a subject that we ought all to be better informed upon; and Dr. Amory, who was then present with us, made some very valuable suggestions. I think that almost every man who has anything to do with gas has his own method of handling this trouble. The general opinion seems to be that if a man is overcome by gas the use of oxygen has met with more favorable results than any other. While talking with Mr. Bradley, Chief Engineer of the Consolidated Gas Company of New York City, the other day about it, he said he had been asked to be present to say something on this subject. He spoke very favorably of oxygen. He said at one time he used whiskey—and I understand that whiskey is an exceedingly good thing to use—but that they had given over its use in the Consolidated Company because the number of men who were overcome with gas increased so much from the use of whiskey that the trouble came to be serious. I understood from Mr. Addicks that in Boston they give their men a sedlitz powder to throw off the gas; and while it may have its use, as I understand it, this trouble affects the constitution of the blood more than it particularly affects the stomach. I think if you will call on Dr. Amory you will get more information on this subject than in any other way.

Dr. Amory—It is rather embarrassing to have some one say that I know so much about this subject, especially as I have not prepared any written paper.

Mr. Lamson—As Dr. Amory is a physician he of course knows the action of these gases on the stomach, and is, therefore, well fitted to tell us what is beneficial treatment.

Dr. Amory—I ought to say in explanation that when I first went to Paris to study medicine I entered my name as a student in Prof. Tardieu's laboratory for the study of poisons, and the first subject given to me to investigate experimentally was poisoning from charcoal fumes, or carbon monoxide, or carbonic acid gas. My instructor, who had been over the subject himself and was familiar with it, a younger man than M. Tardieu, called my attention to the fact (and I found from experiment the truth of this statement) that the real question to be studied was the difference between poisoning by carbonic acid gas and carbonic oxide, as we then called it. Carbonic acid gas is not poisonous. It can be respired. But, inasmuch as it prevents the introduction of oxygen into the lungs, it does not support life. Therefore, a man may die in an atmosphere composed of carbonic acid gas because he cannot get oxygen enough to oxygenate the blood. Carbonic oxide, on the other hand, is respirable, and yet it is a poisonous gas as we all know; and it is a gas more fixed than carbonic acid, and not so easily decomposed into carbon and oxygen. This gas enters into the system through the lungs and satisfies the blood by putting into it carbonic oxide in place of oxygen, and changes the color of the blood to black or venous blood, as we all know it. I was still further taught by this same instructor (and the books of the period emphasize it) that it made a distinct and stable compound with the red coloring matter of the blood; and the basis for this supposition was shown by poisoning an animal with carbonic acid and seeing that the color of the blood was black wherever it was found in the body. It was difficult to restore that blood to a bright red arterial color by blowing oxygen through it. I left the experimenting at that point to take up something else, and will not go into any further details about it. I was satisfied at that time, from the little knowledge I had, that a distinct combination of poisonous material was produced; but the error in the experiment on animals was shown in my later studies, that when the animal died the blood lost its living characteristics. We now know that the inspiration of carbonic oxide gas does interfere with the oxidization of the blood; but we also know that it is not a stable or fixed combination during life, as in this case the poison could not be so rapidly eliminated as known in actual experience of these later years. In other words, if an animal—whether man or a four-legged animal—is taken out into the fresh air, and air is introduced into the lungs, recovery takes place very speedily, and the color of the complexion is changed from that of a sallow, dark shade to a more living, bright color. When we began to make coal gas in our works the men were frequently overcome by the gas, more especially by the blue gas, or the non-illuminating or so-called fuel gas; and the first instance I had of it was when we first let on the gas, before it arrived at the retorts, when the foreman sent up a man to see if there was any leak. He could not smell the gas, of course, but he could taste it; and that is the only warning that our senses give us either of producer gas or pure gas. We all know the peculiar taste it has. The only means of finding a leak of this gas is to wet the finger and put it over a joint and see if there is any sensation of pressure from its escape. The man was not there a minute before he came back and started to go down the ladder, but, as we all know is the case under those circumstances when a man takes the poison, he slipped and rolled the whole length of the ladder down to the floor, and became entirely unconscious. On being removed to the air he was kicked and shaken a little, and came to. Then we gave him some soda water and whiskey. That led me to look into the matter more closely. I looked back to the book on poisons and studied up the subject of differentiation of the symptoms of poisoning from coal gas and water gas according to the authorities of that day. The only great difference mentioned in the symptoms between the two gases, except those which I have mentioned, are the sudden anaesthesia, or sudden loss of consciousness, due to the inspiration of carbonic oxide gas, and to the fact that this symptom does not usually and so quickly take place from inhaling illuminating gas made from gas coal. Another marked symptom was the fact that in cases of fatal poisoning from coal gas inhalation and just before death, convulsions follow, whereas the convulsions are absent from those who are poisoned by the carbon monoxide or carbonic oxide. I will use the words "carbonic oxide" because they are more familiar to us. When I was preparing to say a few words on the subject in response to the request of the Secretary, I looked back to see the method of treatment, which any one could use, and it occurred to me that the reason why sedlitz powders, or soda water, or whiskey and soda water were used, is to drive the gas out of the blood of the man who is poisoned. We all know that the swallowing of a sedlitz powder frees gas of the same character as that which a man has inhaled from aerated or carbonic acid water, and we know that that gas cannot produce any remedial action on the blood, but it does produce an irritation of the stomach. It distends the stomach because of the pressure of the gas evolved, from the internal warmth of the body temperature, and this irritates the diaphragm and excites an expulsive expiration, or a gasping effort. The instant after he gasps the diaphragm contracts and draws down the cavity of the thorax, where the lungs are, and the lung is filled with air. Just as in the case of the new born infant who has difficulty in taking the first breath, you throw cold water on its naked body and it instantly gasps, and so its lungs are filled with air or oxygen. That explains why they use soda water—the whiskey is of no consequence—or a sedlitz powder, or ammonia. A gentleman just mentioned to me that he saw a case revived by the use of ammonia water. The most rational method of treatment, following the indications, would be artificial respiration. I will go back to my further experiments and study on this subject in Paris. The signs which appear after death from poisoning by carbonic oxide gas are exactly like those which follow death from drowning. That is to say, the lungs are apparently or very largely without air; and there are spots on the lungs, and settlements of blood, showing that congestion has taken place, and perhaps a breaking of the blood vessels, allowing the blood to be passed into the tissues of the lungs. The only method of restoration in cases of drowning is, as we all know, by artificial respiration, and it must be very carefully performed. The only indications for treatment that I can conceive at present for treatment of carbonic oxide poisoning is by artificial respiration. But it must not be done with violence. The ordinary rules which you will find in the directions of the Humane Society, of the Commonwealth of Massachusetts, or in any of the leading journals, state what is required for artificial inhalation by the use of outside force by the bystanders. That is to say, you must take the arms and extend them; you thus draw the thorax up; then when you depress them you put the thorax down. If any one will try that motion they will find it is impossible to prevent inhalation in a conscious person. Drawing the arms up over the head, and then drawing them down again forces inspiration. If any one will watch his own breathing he will find he breathes 18 times a minute, or thereabouts. Therefore, in artificial respiration for the cure of the inhalation of any poisonous gas of this character, you must make the movement 18 times a minute, but no faster. If you do it faster than that you may interfere with the circulation through the small blood vessels, and so obstruct the effort which nature makes to restore the circulation from the surface of the lungs or the body; for we need the circulation through the skin and other parts of the body as well as through the lungs. Friction of the surface of the body maintained for the same purpose in the person injured, when recovering, will assist in promoting the circulation of the blood and will also assist in producing respiration. Another curious physio

logical fact is that the desire to breathe is due to the accumulation of carbonic acid in a certain part of the base of the brain, between the spinal chord and the brain. That produces a nervous irritation there which excites the desire to breathe, as well as from the contact of air on the surface of the body. Now if the blood is filled with a substance which produces anaesthesia (such as carbonic oxide gas), carbonic acid has no opportunity for accumulating in that part of the brain, and, therefore, from this and the absence of skin sensation, the person ceases to have the desire to breathe, because he is unconscious. And probably—without going further into details, for it is not worth while to go into a lecture on the subject, as you want only practical results—the circulation through the small blood vessels is very quiet, possibly none at all; and, therefore, the first efforts at artificial respiration should be taken very slowly, say 12 per minute by the watch, gradually increasing until the amount is about 18 or 20 per minute. Then, when the person begins to breathe, the best treatment known to-day is the inhalation of oxygen. It would seem, perhaps, as if at some time or other, when we become more modernized and civilized, the use of this new life-giving material will lead us to have in our tool chest a condensed iron jar of oxygen to be used under those circumstances. But, of course, if a person cannot breathe, the oxygen cannot get into their lungs. Therefore, the first effort to be made is artificial respiration with ordinary air, which will free the lungs of the contained irrespirable gas and place there instead the ordinary active gas, or the oxygen contained in the air, which is a large quantity. Then after natural respiration is produced we can begin the inhalation of oxygen, which might be gradually introduced during the process of recovery and during artificial respiration; then, when the patient can himself respire, give the oxygen freely until the man is sufficiently recovered to take care of himself. I think that is about all, without confusing the subject, that I can say on it; but I shall be happy to answer any questions that any one may ask.

Mr. Allyn—In what position should the person be placed?

Dr. Amory—Flat on his back. It may not be generally known that when a person faints he should be placed immediately upon the back, and left quiet. If they do not come too very quickly then you must raise the feet, as that sends the blood by gravity towards the brain and starts the desire to breathe by reason of the irritation at the base of the brain, or top of the spinal chord, in the part which is called the medulla oblongata.

Mr. Allyn—In case an accident of this kind happens in cold weather and the man is out of doors, I would like to inquire whether restoration would not be much more rapid if he were taken in where it was of warmer temperature?

Dr. Amory—Most certainly. Of course exposure of the external surface of the body to a low temperature interferes with the circulation through the smaller blood vessels. Therefore, the person should be placed where it is warm, but also where the body surface can be excited by current of air not in a close room. It would be well for every gas man to get from the Massachusetts Humane Society a copy of the directions to be used in case of drowning. They are very clear and distinct, and are the most sensible of any I have ever seen.

Mr. Holmes—Is not that practically the mode of operation when a person gets an overdose of electricity?

Dr. Amory—Yes. I am glad you have asked that question, because I do not think it is generally known that death from electrocution is undoubtedly due to the suspension of circulation in the small blood vessels, and of the movements of the heart and lungs. Anything that starts the heart and lungs to the active state, as I said before in the case of the new born child, is useful. If you will bear that in mind you cannot go wrong in that way.

Mr. Gifford—I would like to ask if there is any danger from the excessive use of oxygen?

Dr. Amory—There is danger if it be used too long. Therefore a physician should prescribe it. But the indications are so evident when a person is getting too much oxygen—such a conscious feeling of discomfort about the head and chest—that he would ask to be relieved from its use; and as soon as he can ask to be relieved the thing is all done, and the person is practically well.

Mr. Allyn—I thoroughly believe in the suggestion made by Dr. Amory with regard to the advisability of every gas company keeping a cylinder of oxygen on hand ready to tap at the moment of need. Two or three years ago, during a severe indisposition, my vitality got to such a low point that when a crisis arrived, and the doctor was sent for, it was almost impossible for me to draw a breath. The least exertion would check my breathing. The doctor said there was only one hope, which was to get a cylinder of oxygen as quickly as possible. There was a driving snow storm on at the time, but a team was procured at once and sent to Boston for the cylinder. There is only one place in Boston that I know of where oxygen can be procured, which is at Metcalf's, opposite the Boston Museum. A cylinder of oxygen was brought out, and on the first application I experienced relief. After that, for some ten days, I was given an application of five minutes duration every half hour. I fully believe I would not be here to-day but for the timely use of that oxygen. I consumed five cylinders of it the size of an ordinary soda fountain. Its effect was wonderful; it seemed to give me relief at once.

Col. Armington—Had you been inhaling carbonic oxide previous to that?

Mr. Allyn—I do not know. I was not in a condition to know.

Dr. Amory—I would like to mention another pertinent fact. It is known by certain accidents that have happened in the past that if the skin of a person is so terribly burned that the whole surface, or a very large part of the surface, is involved, the desire to breathe is absent. In a case which happened several years ago (I do not remember exactly where it was reported, but I remember reading it at the time) the only persons who were saved, who had serious injuries to the surface of the body, where those who were kept alive by involuntary efforts at breathing. There was someone watching by them all the time to make them breathe. I mention this in order to state that even after apparent death has taken place in a person who is overcome by carbon monoxide gas, or carbonic oxide, or the ordinary illuminating gas from coal, persistent efforts should be kept up for half an hour or longer to make the person breathe, because in such cases life has been restored.

The Secretary—We had hoped that Mr. Bradley, the Engineer-in-Chief of the Consolidated Gas Company, of New York, would be here to speak on this topic. I, however, have received the following letter from Mr. Bradley, who is unable to be here:

OFFICE OF ENGINEER-IN-CHIEF,
CONSOLIDATED GAS CO. OF NEW YORK,
4 IRVING PLACE, Feb. 5, 1895.

MR. C. F. PRICHARD: Dear Sir—Your letter at hand. It is not probable that I shall be able to attend the meeting of the New England Association in Boston this month, and cannot, therefore, take part in the discussion on the treatment of persons partially overcome with gas. My practice was for a long time to dose with whiskey, but it seemed to me that the men (some of them) were overcome upon very slight provocation, and sometimes very frequently. I stopped prescribing whiskey, and the cases decreased. I have used milk and the German decoction named, or called, "weiss beer," but can hardly say if one is either better or worse than the other. I think, however, that the main point in such cases is to prevent sleep and keep them moving. I have in many cases put a man on each side of the person overcome and walked them, and kept them awake for a half hour, or until the effect of the gas passed off. I have never known of a case treated in that way that resulted in death, or any bad effects. Yours truly, W. H. BRADLEY.

The President—I am sure we are all under very great obligations to Dr. Amory for his kindness and courtesy in coming here and giving us this talk. I think a good deal of it is new to most of us. I am sure he has the hearty thanks of the Association for his kindness.

Mr. Joseph E. Nute, of Fall River, Mass., read his paper on

THE EFFECT OF THE INTRODUCTION OF THE WELSBACH LAMPS ON THE BUSINESS OF THE GAS COMPANY.

In its improved form the Welsbach lamp was first placed on the market something more than two years ago. Since that time its use has rapidly extended over the entire country, until now there are few cities where it is not a familiar sight. The lamp has been introduced in many cities for a sufficiently long time, and in such numbers, that we ought now to be able to obtain fairly accurate information as to its effect on the business of the gas company, and to answer the enquiry, "Is the Welsbach to be welcomed with open arms by the gas manager as a friend and ally, and its introduction encouraged by every means in his power, because of the large number of electric and oil lamps that can be displaced by its aid; or is the loss of consumption so great where the Welsbach is substituted for ordinary burners, as to more than offset the gain in the other direction, so that he ought rather, in the interests of his stockholders, to hinder, so far as possible, its introduction and extension?" Though I believe that any improvement or invention which reduces the cost of our product to the consumer, or that increases the efficiency that he can obtain from it, will be of ultimate benefit to the company, still, no doubt, the apparent prospect of an immediate and considerable loss of gas sales has deterred many managers from urging or assisting in the extension of the use of the lamp.

To those who are of the opinion that the losses will more than counterbalance the gain, I wish particularly to give the benefit of our experience at Fall River, which, I doubt not, is very similar to what has generally been obtained in other places.

We received our first samples of the lamp about two years ago and have sold up to the present time some 2,300 of them. During the past year we have sold 1,499 lamps. I have run through the books and separated, as accurately as possible, the lamps sold during 1894 under four headings: First, those that have been put on in place of ordinary gas jets; second, those that have displaced electric lights, either arc or incandescent; third, those that have been substituted for oil lamps; and fourth, those that cannot be classified under one of the three previous heads, such as lamps placed in new buildings or sold to parties opening new stores in old buildings, etc.

I find that 523 Welsbachs, or 34.9 per cent. of the whole number, came under the first classification; 387, or 25.8 per cent., under the second; 330, or 22 per cent., under the third; and 259, or 17.3 per cent., under the fourth. The number under the first head, however, is too large, and under the third, too small; for the reason that all the lamps that have been put into private houses have been placed under the first classification, as I had no means of determining whether these lamps displaced oil or gas. Of course, many of them were bought to be used for reading lights in place of oil lamps.

If now we assume that the gas burners that have been displaced by the Welsbach lamps consumed, on an average, five feet per hour (and this, I think, would be a fair estimate), then the loss of consumption amounts to two feet per burner, or 1,046 feet for every hour the 523 lamps are in use. On the other hand, 717 Welsbachs have been placed where before no gas was burned—that is, in place of oil and electric lights—making a gain of 2,151 feet per hour, or an actual net gain, for the 1,240 lights, of 1,105 feet per hour, which figures out .9 feet per lamp per hour.

If the 249 unclassified lamps have gained for us a proportionate consumption, then the net result of placing 1,499 Welsbach lamps last year has been an increase in consumption of 1,338 feet for every hour they are lighted. Figuring that these lamps burn on an average 12 hours per week, the increased consumption amounts to 834,900 cubic feet per year, which is certainly an item of income not to be neglected.

If, in addition to the positive gain that I have shown, we take into account the number of our customers who, without the Welsbach lamp, would have changed to some other form of illumination, we have a still further argument in favor of the incandescent lamp.

As corroborative evidence that the effect of the lamp is favorable to an increased sendout, I would say that last year, notwithstanding the general business depression, our sales to our consumers (leaving out the mill meters, on which there was naturally a considerable loss owing in part to a two months' strike) increased nearly 8 per cent. over 1893, while the number of meters gained was 40 per cent. larger than for either of the two preceding years.

Discussion.

The President—You have heard a very practical paper, and all doubtless have been questioned a number of times as to whether it paid a gas company to introduce the Welsbach lamp. Here is a case where one of our New England Companies has demonstrated fully that it does pay to introduce that lamp. It is a subject in which we all are most deeply interested; and I hope there will be a general discussion.

Mr. Taber—In order to get at the matter more closely, will Mr. Nute give us again the divisions in which he has classed the number of lamps placed during the past year. I did not hear him quite well enough to follow. He had a certain number for each of the four classes. Will he give those numbers by classes again.

Mr. Nute—There were 523 Welsbach lamps; 34.9 per cent. of the whole were put in in place of ordinary gas jets, or, as I explained afterwards, in place of oil lamps for reading lamps in houses; 387, or 25.8 per cent., were put in place of either arc or incandescent lamps; 330, or 22 per cent., were put in place of oil lamps, and 259 were unclassified.

Col. Armington—What was the natural increase of gas during that year? We would like to know about that, for we want to know whether the consumption held out, and what the natural increase would have been.

Mr. Nute—It would be pretty difficult to tell what was natural increase last year. We actually made an increase of consumption of about 8 per cent. We figured out that the actual increase due to the Welsbach lamps was about one-third of the total increase for the year.

Mr. Addicks—I would like to ask Mr. Nute whether he has any electric light in connection with his Company?

Mr. Nute—I am happy to say I have not.

Mr. Addicks—I heard several gentlemen speak on this question, but in considering it it is important to know whether the speakers have simply a gas company, or whether they have an electric light plant in combination with it. I believe there are some gentlemen here who can give us figures on this question, and I trust they will do so.

Mr. Gifford—Our Company at New Bedford operates both a gas and an electric light plant. In looking over the books the other day, after receiving notice this paper was to be read, I found we had about 30 stores in town using the Welsbach lamps. I found that 10 per cent. of those had replaced arc lamps, 20 per cent. had replaced ordinary gas burners, and that the remaining 70 per cent. had replaced incandescent electric lamps. None of the business had gone out of the hands of the Company. In that case the income to the Company had been reduced. I had no means of ascertaining how many oil lamps had been displaced in house lighting, but we hope that some have been so displaced. Thus far it seems to have operated against the income of the Company. We believe, however, in seeking the mutual interests of the consumers and of the Company, so that we hope it will eventually turn out all right. With warmer weather we hope more oil lamps will be displaced.

Mr. Lamson—We have some Welsbach lamps at Worcester, and if you will promise not to say anything about it when you go there, I will tell you I think it is doing us some good, although the general impression in Worcester at the present time is that the people have got the better of the Gas Company. The Boston Gas Appliance Exchange people have established an Exchange at Worcester, and have put in quite a number of lights. They have taken the matter entirely into their own hands, and I have had nothing to do with it. The public in Worcester tell me what a good thing it is, and then they talk as if they had now got something with which they could get the better of me. In reply, I say to them I do not doubt it is a good thing, and that while it cuts down our consumption a good deal, of course, we have to stand it; that these people have come there, and that I cannot keep them away. So the thing goes on. I do not think the output of the Gas Company has dropped much. I have not the figures with me, but I will say that Welsbach lamps have displaced many incandescent electric lights; that they have displaced quite a number of oil lamps; and that they have displaced a goodly number of arc lamps. I am sorry to say they have also displaced quite a number of good sized gas burners. I think, however, on the whole, they have been of decided advantage to us. The light itself is very much more durable than it has ever been before. The methods of using it [the artistic shades and burners, and the new chandeliers and brackets which they have introduced] are an advantage. I think the electric light people had an advantage over us a short time ago, because they were able to produce such artistic effects with incandescent lamps that they were made very attractive in house decoration. The Welsbach people have advanced more in that matter than any advance in a similar line that has been made in the gas interest heretofore. Some of their methods of lighting are exceedingly unique and tasteful. I have in my office one of their chandeliers—a very light and graceful affair, with eight burners enclosed by ball globes, with no chimney, which are operated by a "pull down," and the effect is exceedingly decorative. I have a strong feeling that gas people ought in some way to make an effort to alter the color of the Welsbach light. Although I committed an error in the eyes of the Welsbach people last year by criticising the color of the light, still I have the same feeling with regard to the color of the light now that I had then. I believe it would be greatly to their interest to increase their efforts to in some way take away the ghastly look of the light. I think some they are now introducing tend to get over that trouble; but they might be introduced in a great many more houses were it not for that defect—in places where they will not be put in simply because of the difference in color. They are trying at the present time to overcome that difficulty in color by the judicious use of shades. I think gas men in general are agreed that the Welsbach light is an advantage. I think if you will press the electric button on Mr. Taber he will have something to say on the electric side of this question, as he has some doubt whether it has affected the electric business.

Mr. Taber—I do not know why I should be called on, for I am not an electric man; I am a gas man. All the same, I wrote to Worcester to find how many of those electric lights had been displaced. If Mr. Lamson will tell you how many lights they put in in Worcester I think it will surprise you to know how many electric lights have been displaced by it. Do you know Mr. Lamson?

Mr Lamson—I know nothing about it.

Mr. Taber—They swear that they have lost only 150 lights in the Worcester Electric Light Company. I am taking the other side of the

case just now for the time being, because it seems as if it were a matter in line with something which has been in my mind for many years—that we should put forth our energies, if possible, not to the displacement of either gas or electricity, but in the taking up of that great field of which our President spoke this morning—the piano lamp, and the oil reading lamp on the table—which has been more satisfactory in a general way than the argand lamp which we found there when we were younger. The electric incandescent light had an advantage over the old argand lamp on account of the heat of the argand. Now, if this new Welsbach lamp can, in the parlors, fill the bill faithfully in lighting the study table and the parlor table, we shall find a great use for it there, irrespective of the relative advantages of the incandescent or the gas light in stores. My own thought with regard to this is there are a great many cases where, not being able to use the one, you must use the other. In many of our store windows, which are often filled up with light combustible materials, an open flame burner cannot be used; in other places an open flame is better than the incandescent light. I think the energies of our companies should be directed to the fields in which the material can be used to the most advantage, irrespective of whether we are trying to cry down an opponent or not. I grant that a good handle has been made of the Welsbach as against the electric incandescent light, but I have always answered that by saying if I had the opportunity I would make the fellow who put in the incandescent light hum before I would take the electric light off.

Mr. Lamson—That I cannot reconcile very well with the facts. Having no figures about this thing I am rather inclined to think the 150 electric lights displaced in Worcester must have been 150 arc lights. That would be the only way in which there could be any truth in that statement. With regard to the fellows who have taken them back, while I do not claim to know anything about it, I will say the only two who have taken out the incandescent Welsbach lamp and put back the electric light—or, rather, one who has an oil lamp, and who I know has the light in his house, for he has taken them out of his store—that I have a suspicion he did so because he sells a very large amount of lubricating oil to the electric company. The other man who took them out had a large cloak store. He took them out after saying he believed in them, that he never had had such a satisfactory light in his store, that he could see the goods better than with any light he had ever had, and that his bills were very much less than they had ever been for any other form of light; yet he took them out because his neighbor had put in electric arc lights and he thought he would be behind the times unless he also had them. Those two people are the only ones I know who have taken them out.

Dr. Amory—Is there not a simple way in which we can get at the facts in Worcester, or in any other town? As I understand it the Welsbach consumes only about half the amount of gas consumed by the ordinary burner. If that is the case the consumption of gas would show quickly enough the use of the Welsbach burner. Cannot our friend Lamson tell us whether his daily output has been reduced?

Mr. Lamson—It has been cut down somewhat. I have not got the figures for January, but I think we only gained a trifle in excess of 20 per cent. over January of last year. (Laughter.)

The President—I think Mr. F. H. Parker has had some experience with the Welsbach lamp, and can give us some information.

Mr. Parker—We have introduced them only recently; but within the last year, and in a very dull time, we increased our output over 25 per cent.

The President—I had the impression the increase was largely due to the Welsbach burner; and that you were displacing electric lights in spite of yourselves.

Mr. Parker—As it is only recently we have replaced electric lights with Welsbach burners, I cannot be positive about that.

Mr. Rossman—We handled them for the last five years. We started in with the old form. To-day I think that about 90 out of 100 stores are using Welsbach lights. In the last two years the Welsbach has replaced kerosene, until to-day, in a town of 10,000 inhabitants, only three stores are using kerosene. We have always run the electric arc system, never the incandescent. We started off last fall in the endeavor to put in an electric incandescent plant. Two of our agents who went through the town endeavoring to get subscribers, were always asked at the start, "Can you light our store as cheaply as we are doing it with the Welsbach light?" "No; we cannot." "Can you give the same amount of light for 25 per cent. of the cost?" "No; we cannot." We worked for three months trying to establish an incandescent plant in a town of 10,000 inhabitants, but could not get it started. The best we could do was to get about 100 incandescent lights. In 103 stores, 98 are burning gas, and they have had the Welsbach light for five years.

Mr. Lane—It is not very often I have a chance to say anything that would interest anybody, because it does not touch upon what others are interested in, inasmuch as I make oil gas; still, as I have commenced on the Welsbach light, I will tell you what we have accomplished. I have not made any percentage of the amount displaced. We started in a small way. We put the first in on the first day of May. It has been almost impossible to get the lamps. To show you the life of the mantle, I may say that, on the 1st of May, we put on 7 of the lights, and on the 1st of June we put on 4 lights which displaced arc lamps, or 11 lights. Up to the 11th inst. only one had been replaced, and that was a mantle which had been accidentally destroyed—this was in a drug store, and now they have two or three extra mantles, so as to have them on hand. I have in six instances replaced arc lights with four of these; and in every instance they say they like the light very much better; that it gives them a better light for less money. The arc lights are sold there for $4.50 per month. Hence you see that even with the arc lights at a low rate we can beat them with our price of gas. It only costs one cent per hour to burn the Welsbach lights at our price of gas, and 10 feet of gas per hour will give better satisfaction than an arc light. We have several new stores which we light entirely with the Welsbach, and which we would probably not have had at all but for the Welsbach light. Two or three of our stores have changed. They take just about the same amount of gas, but they have two or three times the amount of light. In the houses I have not especially tried to sell any, because I could not get the lamps; but with them we have displaced several table lamps. Only in one case have I heard complaint with regard to the color of the light, when a lady said that its color was rather "funny." Possibly the mantles may differ. In the stores I have not heard the color spoken of. They say they can tell the color of fabrics just as well under the Welsbach light as they can under the arc light. We have the same consumption, and the same number of consumers; and we have got in nearly 200 lights, nearly half of which displaced electric lights; or where they would have had electric lights if they had not had the Welsbach.

Mr. Todd—I will tell you what we are displacing with the Welsbach light. In the last three months I have lighted ten stores and one hall. Four of those stores had large Rochester lamps, the others had incandescent electric lights. All of the storekeepers say to-day their places are better lighted than they were with either the incandescent or the large oil lamps. In the music hall were 36 incandescent electric lamps; I put in 8 Welsbach lamps—I wanted the proprietor to put in 10, for I thought 8 Welsbachs would hardly replace 36 incandescent lights. However, he told me to put only 8 in the hall. He says that the hall is better lighted now than it was with the 36 incandescent lights. In Hyde Park also are six other storekeepers waiting to put in the Welsbach whenever I can get them. Unfortunately Hyde Park having lost the knowledge of such a thing as gas, half of the houses are without any gas piping. I received an order for two this morning, and have orders for six on my books, and expect some more soon, as there are one or two other stores where I expect to put them in. In the houses I put in a good many, but I do not put in so many as I do where there is either incandescent or arc lighting.

Mr. Lane—When did you commence putting in the Welsbach lamp at Hyde Park, and how many lamps have been taken out?

Mr. Todd—We have taken none out since I started four months ago, but we are putting them in every day.

Mr. Lane—I asked that because a certain electric man made the statement that the Welsbach lights had been put in at Hyde Park, but that all of them had since been taken out.

Mr. Todd—We have taken none out. We cannot get them fast enough to put them in as wanted.

Mr. Coggeshall—Mr. Nute's paper is a very valuable one, for it gives us facts. His statement is that 25 per cent. of the Welsbach lights displaced electric lights—arc or incandescent—and that 22 per cent. displaced oil lamps, making a total of 47 per cent. There was certainly a clear gain. He says his increase last year was 854,000 feet, and almost 50 per cent. of that was a gain on oil or electricity. I represent one of those unfortunate companies that have gas and electric light plants. The Welsbach light is a bad light for me, and not very profitable. We put in about 900 at Fitchburg, and our decrease in incandescent electric light receipts amounts on the average to about $200 per month. So you see that we do not want to do any missionary work there. One word more with relation to the Welsbach lamp. If that lamp had been on the market before we negotiated for the electric light plant we would not have wanted any better fun than to fight them on that ground.

Mr. Coffin—Did the Gas Company do the missionary work there, or was it an outside party?

Mr. Coggeshall—An outside party.

Mr. Coffin—I thought the Welsbach people did not put lights where they had to meet competition. We have about 800 lights, and I have tried to make some figures on the advantage of them. While we have not pushed them very hard where people were burning gas—if asked about them we told the truth, and have furnished the lamps—we have tried to push them in competition with oil and the incandescent and arc lights. Our results, as we think, are these: Our gain from the electric people offsets what we lost from gas consumers, and what we got from oil was clear gain, or very nearly one-third of the business.

Mr. Addicks—I am glad I asked the question what gentlemen having electric light plants in combination with gas thought about it. It strikes me they do not think quite so well of it as the rest of us do. I have not had charge of putting in the Welsbach burners, for it has been done entirely through the Boston Gas Appliance Exchange, and so I have no figures with regard to it, but my observation is that in places on Washington street where they formerly used electric lights they are now using the Welsbach burner, and many people have been prevented by the use of it from putting in electric lights. I have used the Welsbach burner at home for three years. I would like very much if I could hear some statements with regard to the color of the light, and as to whether that is not possibly an advantage in the determination of color in practical use in stores. I cannot see any objection in stores on the score of color, but I personally object to it at my house. In order to overcome that objection I use on my lamps shades similar to those used on banquet lamps, and it would be impossible for you to know that I had a Welsbach burner in use until you got under the light. I have also used the new style of lamp, without a chimney, and with a tinted globe for hall use, and in the apartments, and find it very useful and very efficient there; but I think it would be very objectionable for use in a library or parlor without a shade over it. As regards the life of the mantle, I may say that I have new mantles about once a year, and I am perfectly satisfied with the light I get from those in use. I merely state these personal experiences to show that you can use the Welsbach lamp in your houses with advantage and satisfaction. I am satisfied that the giving of the greatest amount of light for the least amount of money will result in bringing consumers and gas companies in better accord.

Mr. Lane—One word more as to the color of the light. I said I had heard no fault found with it, except in one case, where they had an ordinary burner in the sitting room on the chandelier; it is there where they alluded to the color, and that was the only instance.

The President—We have with us a gentleman from St. Louis—Mr. Chollar—who must have had some experience with this burner, and we would be glad to hear from him.

Mr. Chollar—In St. Louis the gas companies have nothing to do with regard to introducing Welsbach lights, but we have a very large number of the lights there. They are sold by one of the largest gasfitting houses in town. There are probably 20,000 in use in our city. I do not know it as a fact that there are 20,000 in use, but I would not be surprised if there were that many. At first we thought the tendency was rather to decrease the output, but latterly we have thought differently. They have certainly displaced incandescent electric lights very largely—so much so, in fact, that the electric companies feel rather unpleasant toward us, and think we are pushing them too hard. We have an electric plant of our own, which it interferes with to a certain extent, but our impression is, taking it altogether, that it has quite largely increased our output and the profit of the company. They are very satisfactory to the consumers, and we very seldom have complaint from them. The number in use is increasing every day. We think very highly of them and recommend them accordingly.

The President—We have with us the President of the San Francisco Gas Company, Mr. Crockett, and we would be glad to hear how the Welsbach burner is succeeding on the Pacific Coast.

Mr. Crockett—Although I am about 3,000 miles away from home, I find that your experience has been about the same as mine. We have all been through the same thing apparently. I have introduced a great many Welsbach burners in San Francisco, and they have been very successful in meeting the competition from electric lights. The trouble is that we cannot get them fast enough. So few of them are obtainable that it seems hardly necessary for us to canvass for the trade. We sent a man out who got orders for 300 lamps in one afternoon. Some six weeks afterwards we were supplied with somewhere in the neighborhood of 30 burners, and were told it was impossible to send us any more for a long time. Therefore we had to lose those customers. They told me they could not get them to us fast enough. We have not the slightest trouble in introducing the lamp; the only trouble is that we cannot get the lamps as we need them. They have given great satisfaction wherever we have put them in. We have only introduced them, as far as possible, in competition with the electric light.

The President—We are very glad to hear this evidence from the Far West. Is there any other discussion of the question?

Mr. Allyn—As an indication of the effect that the introduction of the Welsbach light is having on the electric light business, I will say in conversing a few days ago with the President of an electric light company near by, who is on very good terms with me, I asked him what the indications were the coming year for his business. He said, "If we hold our own the coming year we think we will be doing remarkably well. The fact is that the Welsbach lights are being so generally introduced and displacing our incandescent electric lights, that if we succeed in holding our own I shall think that we are doing remarkably well."

Mr. Coffin—I would like to ask if the color of these lights has not been somewhat modified; or is it because we have got used to them? It seems to me in the last two or three lots we had the color of the light is not near so ghastly. It seems that they have almost overcome that green, pale, unwholesome look they at first had. It may be, however we have got more used to it and do not notice it.

Mr. Nute—I think it is both—that they have yellowed the mantel and that we have got a little more accustomed to it. It has seemed to me that, although the light seemed rather white when first introduced, after a few months' use of it I did not notice it at all.

Mr. Lamson—I think the light is not as green as it was. It is still very white, but I think they have succeeded in reducing somewhat the greenish hue. We are getting more used to them. As we group them more we also overcome the ghastly effect. The real trouble in the use of the Welsbach light in the matter of color is undertaking to use a single light. Then you do get the ghastly effect. But if you group the lights and get a stronger light you are able in that way to do away with more or less of the greenish effect.

Mr. Addicks—I think the color of the walls also has something to do with it. I have noticed that, in a hall on West street, where the walls were tinted, the color was not objectionable. In a restaurant on Tremont street, just beyond West street, where the walls are of a different color, the light is not as pleasant. It is my observation that the unpleasant effect of the burners is largely due to defective mantles, and I think it is also a question of the tinting of the walls.

The President—If there is to be no further discussion on this question I desire to put a motion which I am sure you will be glad to have made—that the thanks of the Association be tendered to Mr. Nute for his very valuable paper. (Carried.)

[To be Continued.]

The Manufacture of Carbide of Calcium by Electrolysis.

[This article was prepared for the JOURNAL, by Mr. Frederic Bredel, C.E., at our invitation.]

The process is similar to the manufacture of carbon silicon (carborundum), and is done by subjecting fresh burned lime, in the presence of carbon, to the heat of the electric arc, when two reduction processes become possible:

(1st.) $2CaO + C + 4C = 2CaC_2 + CO_2$; or,

(2d.) $CaO + C + 2C = CaC_2 + CO$.

The latter formula seems the more probable, as the CO_2, formed in the first process, would be reduced to CO, if subjected to the heat of the arc in the presence of C.

The energy required to make the reduction according to formula No. 2—viz.:

$$56\text{ g. } CaO + 36\text{ g. } C = 64\text{ g. } CaC_2 + 28\text{ g. } CO,$$

is as follows:

Heat absorbed by heating 24 g. C to the heat of the electric arc:

[1] 24 × 3,000 × 0.46	32.12 Cal.
[2] Reduction of 56 g. CaO to 40 g. Ca 16 g. O	132.00 Cal.
Total heat required	164.12 Cal.
Heat produced to burn 12 g. C to 28 g. CO	28.59 Cal.
Net heat required	135.53 Cal.

In the above formula no attention is paid to the formation heat of $Ca2C = CaC_2$, which can either be positive or negative; but as in both cases it can only be very small, it therefore may be left out.

1. Heat of electric current taken as 3,000° C. Spec. heat of coke = 0.46.
2. See Naumann 82, p. 511.

The aforesaid amount of heat is required to make 64 g. CaC_2, or, per 1 kg., $\frac{1{,}000 \times 135.53}{64} = 2{,}117.6$ Cal.

Add 15 per cent. for loss by radiation, and the total heat required to make 1 kg. CaC_2 is 2,435 Cal.

As 1 H.P. = 637 Cal., of which possibly 80 per cent. could be obtained by electrolysis, or the energy of 1 electric H.P. = $637 \times 0.80 = 510$ Cal.

Therefore, to manufacture 1 kg. CaC_2, $\frac{2{,}435}{510} = 4.78$ electric H.P. are required.

Besides the above energy, there are required:

1st. Carbon to burn out the O in CaO = $\frac{12}{56}$ of the weight of CaC_2.

2d. Carbon to combine with Ca to CaC_2 = $\frac{24}{64}$ of the weight of CaC_2, or, in total, 36 kg. carbon for every 64 kg. CaC_2, or 50.6 carbon per 100 kg. CaC_2, or about 60 kg. coke for 100 kg. CaC_2, taking ashes and moisture into consideration.

3d. Lime to be reduced to Ca = $\frac{40}{64}$ of the weight of CaC_2, or 87.5 kg. CaO per 100 kg. CaC_2, or, expressed in best commercial, fresh burned lime, about 95 kg. per 100 kg. CaC_2.

The cost of manufacture and distribution would, therefore, consist of the following items per 1,000 kg. CaC_2:

1st, electric H.P. to transform into heat 4,780 H.P.; 2d, powdered coke to burn out the O, and combine with Ca, 600 kg.; 3d, fresh burned lime, powdered, 950 kg.; 4th, cost of transforming high potential into low potential current (loss in transformer); 5th, cost of carbon; 6th, repair of furnace; 7th, labor; 8th, packing in air-tight barrels and cost of barrels; 9th, freight from place of manufacture to place of consumption; 10th, office expenses, interest on plant, working capital, royalties, taxes, etc.

Taking it for granted that cheap electric power (Niagara water power) could be obtained, the lowest price obtainable would possibly be $15 per electric H.P. per annum, of $310 \times 24 = 7{,}440$ H.P. hours of a pressure of 2,000 volts; wherefore the amount of power required per 2,000 pounds would be 4,302 H.P., instead of 4,780 per 1,000 kgs.

When water power is not at hand, to raise the necessary amount of power required by coal under the steam boiler would cost, probably, three times as much, taking cost of attendance on boiler, engine and dynamo, repairs, oil for lubricating, interest on power plant, and everything in consideration. The best that could be done would be from $40 to $45 per electric H.P., with run of mine coal, say, at $1 per ton delivered at factory. The consumption of run of mine coal is 1.6 pounds per H.P. hour, when using triple expansion, inverted engine (marine type). The following calculation is based on water power at $15, and an output of at least 15 tons of material per day, which would require about 2,700 H.P. per day of 24 hours, and result in the production of material equal to a make of 1,500,000 cubic feet of 20-candle power gas.

Therefore, the cost of 2,000 lbs. of CaC_2 would be:

1st.	H.P. = $\frac{4{,}302 \times 15}{7{,}440}$	$8.67	
2d.	1,200 lbs. powdered coke, at $3 per ton	1.80	
3d.	1,900 lbs. powdered lime, at $5 per ton	4.75	
4th.	Cost of transforming current, or loss of 10 per cent.	.88	
	Cost of power and raw material		$16.10
5th.	Cost of carbon for 4,302 H.P. hours	$4.30	
6th.	Repair of furnace	2.50	
7th.	Labor	1.00	
8th.	Packing and barrels	.60	
9th.	Freights	4.00	
	Cost of manufacturing and freight		$12.40
	Total net expenses		$28.50
10th.	Office expenses, plant, royalty, taxes and interest, 40 per cent. of above		11.50
	Or total cost per 2,000 lbs. CaC_2		$40.00

Item 10 might seem high, but it is in fact very low. On an output of 15 tons per day, or 4,680 tons per annum, at $11.50 per ton, would only amount to $53,820. Figuring the office expenses at, say, $20,000, there is only left $33,820 to pay interest, royalties, taxes, etc.

The Value of CaC_2 for the Manufacture of C_2H_2 and the Illuminating Value thereof.

When water is slowly dropped on CaC_2 the following reactions are possible:

$$CaC_2 + H_2O = CaO + C_2H_2; \text{ or,}$$
$$CaC_2 + Aq. = Ca(OH)_2 + C_2H_2.$$

One pound carbon calcium makes practically about 5 cubic feet C_2H_2 gas (theoretically about 5.7 cubic feet), or 1 ton CaC_2 produces 10,000 cubic feet of C_2H_2, with an illuminating power of from 200 to 250-candle power per 5 cubic feet, or a gas ten times as good as a 20-candle power illuminating gas.

Ten thousand cubic feet C_2H_2 cost on CaC_2 $40, and are equal to 100,000 cubic feet illuminating gas of 20-candle power; or 100 cubic feet C_2H_2, equal to 1,000 cubic feet illuminating gas, and the cost is 40 cents for CaC_2 alone.

Literature.—See Musspratt, who describes the process as follows. (See 4th ed. Vol. 2, '87, p. 259): Ca, brought in contact with C under high heats, forms carbon calcium, which, brought in contact with water, forms (resp. decomposes into) lime hydrate and acetylene.

Comparison of Amount of Light Produced by 1 H.P., if Used in the Manufacture of C_2H_2, against Incandescent Lighting.

One ton CaC_2 makes 10,000 cubic feet C_2H_2 of 20-candle power per foot, or 200,000-candle power per ton, and requires 4,302 H.P.

To produce 200,000-candle power incandescent light—

$$\frac{200{,}000}{160} = 1{,}250 \text{ H.P. are required.}^1$$

Distribution, cost of plant, carbon and all other expenses are about alike in both processes.

[Concluded from page 223.]

A Method of Permanently Protecting Underground Pipes from Electrolytic Corrosion.

By Mr. Harold P. Brown.

VI. Motor Dynamo between Pipes and Rails.—Another method of pipe protection which has been suggested, but never to my knowledge put into practical operation, is shown in Figure 3, in which *G* represents a motor dynamo, whose motor or driving circuit leads from the trolley wire *T* to the rail *R* through the wire *h i*. Its dynamo circuit is supposed to pump current to the rail from the pipe *P* at *t*, the point that in Fig. 1 was positive, through the wire *j k*. The motor dynamo, to accomplish this purpose, would have to deliver through the circuit *j k* a current flow equalling one-quarter to one-third the output of the dynamos *A B;* these would have to do corresponding extra work in driving *G*, and the trolley wire *T* and rail *R* would have to carry a correspondingly increased current. Moreover, if the effect of this operation were to make the rail positive to the pipes, which it is desired to do, current would wastefully flow from *R*, through the earth at *t*, to the pipe *P*, and through circuit *j k* back to the rail. This local circuit would thus cause a useless absorption of power.

VII. Insulated Rail Feeder Wires.—Some few engineers have insisted that running insulated feeder wires to the rails would protect the pipes. This, for the reasons given in Section IV., could not be of any help unless the rails also were insulated from the earth.

VIII. Pipe Feeder Wires.—Another scheme of pipe protection frequently advocated in the past year has two points in its favor, one of which, however, if true, is a serious reflection upon the condition of the road using it, and a rather grim joke upon the engineer advising it. It consists in connecting the negative terminal of the dynamos with a feed wire leading to the points upon the pipes which are positive to the rails. The theory advanced is that this connection will "make the pipes more negative than the rails." This ideal result is utterly impossible, unless when broken or rusted bond wires are present in all four rails not far from the station.

Referring again to Fig. 1, it is proposed to run a pipe feeder wire from the negative pole *e* of the dynamos to the pipes at *t*, where they are positive to the rails. This wire is supposed to "pump the current out of the pipes" and make them negative to the rails. Assuming, as before, that there are four continuous rails or their copper equivalent, leading from *t* to the power house, and that, as is generally the case, one-third of the current is returning on the pipes from *r r* to *t*, a pipe feeder wire from the latter point to the station would require a cross-section of 18 square inches if iron, or 2 square inches if copper, to make the pipes at *t* of the *same* potential as the rails at that point. But to make the pipes sufficiently negative to the rails to be safe, this cross-section would need to be at least doubled. If, as was reported from one city whose pipes were "protected" in this way, the pipes were really negative to the rails when a connection of this kind was made with a wire of practical size, it is evident that the rail returns from that point were in so bad a condition that nearly 20 per cent. of the total current was lost in going

1. One H.P. feeds 10 lamps of 16-candle power.

1,500 feet from the power house. Protecting the pipes at such a tremendous cost might be worth while if it really did protect them, but it cannot do so for any definite period. The rail bonds are sure to be patched when they get very bad, and within a very short time the contact at *t*, between the pipes and their feeder wire, will become so poor that the old condition will reappear. Few electricians appreciate the difficulty of making and maintaining a good electrical contact between two different metals even in a dry room. And still fewer have any idea of the tremendous difficulty in maintaining such a contact underground.

For the past four years experiments have been under way at the Edison laboratory to obtain between underground steel conductors a perfect electrical contact that would not be injured by water, acid, alkali or mechanical movement. Every practical combination of metals, every method of joining, of excluding moisture, of providing for expansion and contraction, has been tested with heavy currents and then buried for the test of time. The conductors have been machined and scraped to an exact fit, bolted together under heavy pressure, plated with copper, tin or zinc, provided with sheet lead, tinfoil or other soft metal, or various non-oxidizable alloys placed under compression between the surfaces, covered heavily with paint or other water repelling insulation, or a combination of several of these. But time and heavy currents have caused the failure of every device with but a single exception, of which more later.

When two different metals are joined in an electric circuit there are three sources of loss that must be encountered: First, the resistance of the metal itself; second, the contact or surface resistance which can be somewhat reduced by increasing the pressure; and third, the thermo-electric loss. Electricians always calculate upon the first, sometimes give scant attention to the second, but entirely ignore the third. Yet with heavy currents, the total loss is often three times the amount due to the first alone. The causes and cure of these latter losses are outside the scope of this paper; but the maintenance of an underground contact between a copper wire and a steel rail, or an iron or lead pipe, is a problem that requires notice here. However ample the area of contact between such surfaces, however great the pressure holding them together and however careful the methods of excluding moisture, there are several agents of destruction constantly at work that are bound to succeed. Even when two iron plates are joined together in the best mechanical way and placed underground, their surfaces are sure to rust; oil or grease, of course, cannot be used between them. Even a thin film of iron oxide on either surface is of high electrical resistance, injures the conductivity of the joint, and permits the entrance of more and more moisture, thus causing further damage. But when a plate of iron and a plate of copper are bolted together and buried, the difficulties of maintaining an electrical contact are greatly increased. The two metals in contact with the moisture of the earth form a galvanic couple whose action corrodes the iron. The different ratios of expansion due

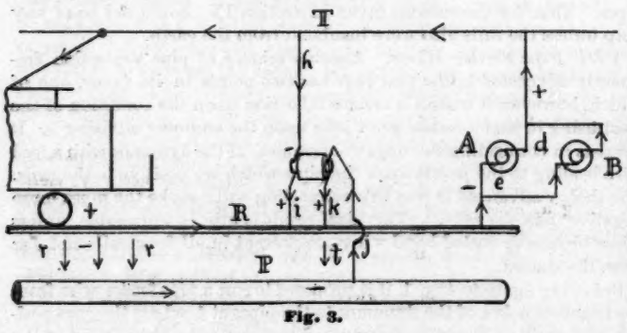

Fig. 3.

to increase of temperature from weather or current flow, break down both the contact and the protecting paint or other covering, letting in water. And the different rate of molecular vibration of the two metals due to the transmission of current has a similar action.

Therefore, any ordinary mechanical connection between an iron pipe and a copper wire is doomed to early destruction. In one city a pipe clamp is used in which lead is placed between the pipe and the clamp and the whole "insulated" with cotton tape and black paint. It requires slight engineering skill to predict the life of painted cotton as a means of excluding water. And as for the lead, which is evidently used to secure a compression contact and save careful fitting of surfaces of pipe and clamp, it invites a still earlier destruction, since lead suffers more severely from electrolytic decomposition than iron or copper. And to further increase the resistance of the joint, the clamp is of iron and is welded to the copper wire. Thus a pipe which is already positive to the rails and suffering corrosion is to be relieved by an insufficient feeder wire and the current is invited to pass from iron to lead, from lead to iron, and from iron to copper, suffering a heavy loss at every contact and making three joints where one is too many. With a copper rod ⅛ of an inch in diameter and 30 inches long, having a contact area of 10 times its cross section against an iron plate, the surfaces being bright, accurately fitted and held together by very heavy pressure,

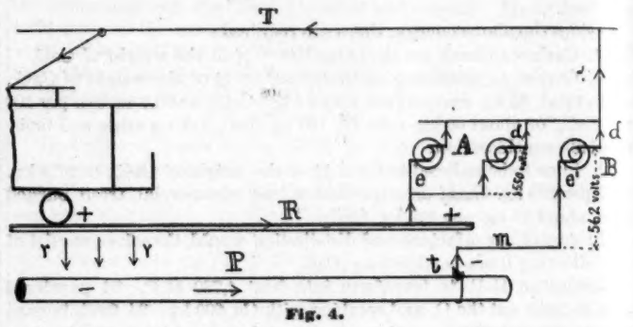

Fig. 4.

the electrical loss was $\frac{3}{10}$ of a volt with 1,200 amperes. In other words, with the best made mechanical joint between iron and copper the loss was .42$\frac{5}{10}$ electrical horse power. Adding the other joints of equal area, iron to lead, and lead to iron, the loss was increased 20 per cent. It is evident that the engineer suggesting this joint has never tested it in heavy service with the proper instruments.

IX. A Successful Method of Pipe Protection.—There are three problems to solve in protecting pipes from electrolytic corrosion:

1st. To keep the pipes at least one volt negative to the rails at all points, and at all times.

2d. To diminish, as much as possible, the flow of current on the pipes.

3d. To secure some permanent, inoxidizable contact of low resistance between the pipes and the necessary feeder wires.

In Fig. 4, *A* represents the main battery of dynamos, whose positive poles *d* are joined to the trolley wire *T*, and whose negative poles *e* are connected to the rails *R* in the ordinary manner. These dynamos are adjusted to maintain the usual 550 volts pressure between *d* and *e*. The dynamo *B* represents at first about one-quarter of the total capacity of the station; but the proportion can be reduced when this plan has been put into service. Its positive pole *d'* is connected to trolley wire *T*, but its negative pole *e'* is connected by suitable feeder wires *m* to the points *t* on the pipes which were previously positive to the rails. The pressure of dynamo *B* is then so adjusted that it gives 5 to 12 volts more than dynamo *A*. As their positive poles are joined, this difference of pressure asserts itself by maintaining the pipes negative to the rails by 12 volts, less the previous positive charge and the loss incurred in passing the current through the feeder wire *m*. For instance, at Newark, N.J., where I am Consulting Engineer for the Board of Works and the Gas Companies, the gas and water pipes were 7 volts positive to the rails at a point about 600 feet from one power house, and the service pipes and lead joints were seriously injured. The average current output of the dynamos was about 1,200 amperes, of which 400 returned by way of the pipes. The dynamos *A* were run at 550 volts, and by running the dynamos *B* at 562 volts, the point *t* on the pipes, which had been 7 volts positive to the rails, was maintained at 3 volts negative, and all further corrosion checked. The closing of the circuit through *m* and dynamo *B* caused a drop averaging 60-horse power in the station load. This was due to removing the resistance of the earth which was encountered by the current in the pipes *P* in passing from *t* to the trolley wire *T*. It will be observed that, unlike the method shown in Fig. 3, all of the current generated by the station dynamos passes through trolley wire *T*, and is used in reaching and operating the motor cars.

This method, as thus far described, entirely checks electrolysis of the pipes, unless it be around some poor joint on same. Such a joint, however, can be easily detected by a low reading voltmeter on the surface of the street and this action checked by continuing the wire *m*, diminished in size, to a point beyond the poor joint. It is true that, as far as described, the tendency of this method is to slightly increase the current flow on the pipes, but this is only the first step in the method. The current reaches the pipes at *r r*, near the ends of the railway lines, and here electrical measurements have shown in some cases at Newark, that the rails were 15 volts positive to the pipes. This difference, o[f]

course, causes a large flow to the pipes, and is produced by poor bonds between the rails and insufficient rail feeders, or by the fact that the network of pipes may lead directly to the power house, while the lines of rails may take a roundabout course. But with proper bonding the difference of pressure between the pipes and rails at *r r* may be brought down from 15 volts to 1 volt, by carrying out from the higher pressure dynamo *B*, a continuation of the wire *m* to the rails at *r r*. By this means and by the proper feeder regulators in the wires *m*, the rails at *r* and the pipes at *t*, whose previous positive potential caused the current flow through the earth, can be made negative and the current flow on the pipes cut down to a minimum. It was feared by some electricians that, in order to keep dynamo *B* at a definite increase of pressure over the dynamos *A*, constant shifting of its rheostat would be necessary as the station load varied, or that the dynamos would not regulate properly. No trouble has been encountered from either source with dynamos of two of the leading manufacturers.

This brings us to the third problem; a permanent, inoxidizable, elastic contact of low resistance between iron pipes and the feeder wires *m*, or between the meeting ends of steel rails, which contact shall possess an "affinity" for each metal. Here the writer has been permitted to share in and to benefit from the experiments leading in this direction suggested by Mr. Edison, and carried on for the past four years. A few square inches on the top of the pipe is filed clean of paint or scale, and rubbed with a silvery metal compound which at once turns any iron rust into a pure metallic iron and amalgamates the surface.

Metallurgists have long considered impossible a stable iron amalgam, but it nevertheless exists and is so permanent that neither water nor any acid or alkali which it will encounter under the streets can decompose it or rust the iron surface beneath it.

A U-shaped bolt is then slipped under the pipe and a cast iron yoke placed over it. The end of feeder wire *m* has been brazed to a copper saddle ½ of an inch thick, fitted between top of pipe and bottom of yoke. The center of the saddle on each side of the wire is cut away to form a receptacle into which, after the copper has been amalgamated, is placed a plastic alloy of electrical origin. The nuts are then tightened up and locked. This alloy gradually hardens and expands, placing the joint under tremendous pressure and forming a perfect electrical contact of extremely low resistance, which will not corrode. Moreover, when a joint between iron and copper is thus prepared all of the contact resistance disappears, and the thermo-electric loss is much reduced. But when this alloy is used between iron or steel surfaces, both contact resistance and thermo-electric loss are eliminated. It will give a comparative idea of the efficiency of these contacts to state that, with a copper rod ¾ of an inch in diameter and 30 inches long, having an area of 10 times its cross section, in contact with a steel plate, with surfaces accurately fitted together and joined with great pressure, the loss in transmitting 1,000 amperes was 24-120 volts. The same with amalgamated surfaces and with the plastic alloy between steel and copper was 13-120 volts. With the plastic alloy between amalgamated surfaces of steel and steel it was but 4-120 volts. Galvanometer tests of joints for heavy currents are of course worthless, as they do not show working conditions.

A large number of these joints were put underground about four years ago in order to make a thorough test. Measurements recently made with heavy currents show absolutely no deterioration. Many of them have been taken up and no trace of oxidation was found, the surfaces being perfectly bright. Thus has the third problem in the way of permanent pipe protection been solved, and its prompt application will save money to water, gas and subway companies, and to the electric railways.

Acetylene and the Gas Industry.

[By Mr. Norton H. Humphrys, in the London *Journal*.]

The discovery by Mr. L. T. Willson of a process for the commercial manufacture of acetylene, which turns out to be the subject of the paper read before the Society of Arts on the 16th ult.; is one that may well be calculated to raise a great deal of interest. It is a pity, however, it was not more clearly indicated by the title. Such a general expression as "The Commercial Synthesis of Illuminating Hydrocarbons," is deceptive, as not being likely to lead one who was not in the secret to expect a detailed account of some particular new process. "Sensation" is all very well in theatrical entertainments, but surprising situations are somewhat out of place in connection with commercial science. Had the real nature of the lecture been indicated, there would have been no necessity for making arrangements to secure an audience. But, after allowing for the personal eloquence and ability of Professor Lewes, it is evident that his subject possesses special fascinations that could not fail to attract and rouse the enthusiasm of his audience. Gas engineers, accustomed to deal with residuals such as coke, tar and liquor, may well stand entranced before a complete gasification process leaving no residual, and calling for no second material as fuel or as enricher. This seems to be afforded by the process described. Given practically pure carbon and lime, the whole of the former is eventually obtained as a gas, while the latter simply acts as a carrier, and returns to its original form. The results approximate closely to theory, and there is no waste. The calcium carbide can be caused to yield its quota of gas by a beautifully simple and almost costless method, but little more troublesome than the trimming of an oil lamp. The fact that a single pound avoirdupois of this remarkable material can be made, by the aid of a few ounces of water, to furnish a brilliant light for 10 hours, and at the same time leave a useful residual, is a triumph of modern science. It seems to me that it cannot fail to secure a future for the new compound, in the direction of compressed gas lighting for buoys, for railway carriages, and so forth. But the point which naturally first claims our attention is the value of this new process in relation to the supply of gas from central stations. In this connection it offers several interesting considerations.

If the results quoted by Professor Lewes are supported by the further research which, I am glad to see, is promised, it will be necessary to modify, if not to entirely remodel, the existing theory as to the production of luminosity by the combustion of hydrocarbon gases. The "carbon density," the specific gravity of the hydrocarbons concerned, and the quantity of oxygen consumed, have all been said to affect the quantity of light yielded; while as to the temperature of the flame, the higher the better. We have been told that an earthenware burner tip is better than a metallic one, because it does not conduct away so much heat from the base of the flame; and that the application of hot air in the regenerative burner increases the luminosity by raising the temperature, or, in other words, preventing the cooling of the flame. Any given quantity of carbon in the form of ethylene gives a much better lighting value than if it existed as methane; and this was explained by reference to the respective vapor densities.

But Professor Lewes shows us a gas having the same carbon density as ethylene, a lower specific gravity, a smaller oxygen consumption, possibly a lower flame temperature, than any of the luminous hydrocarbons (with the exception of methane); and he claims for it a very high illuminating value—placing it, in fact, at the head of the gaseous illuminants. It will be interesting to extend the table of comparative illuminating values quoted by him, so as to show the properties of the respective gases. An examination of this, according to the light of acknowledged theory, fails to indicate any reason why acetylene should be so far superior to the others.

	Photometrical Value.	Percentage of Carbon.	Volumes of Oxygen required by One Volume.	Specific Gravity.	Proportion of Hydrogen Equivalent to Carbon Equivalent.
	(1)	(2)	(3)	(4)	(5)
Methane (CH_4).....	5.2	75.0	2.0	0.553	4.0
Ethane (C_2H_6).....	35.7	80.0	3.5	1.037	3.0
Propane (C_3H_8).....	56.7	81.8	5.0	1.522	2.66
Ethylene (C_2H_4).....	70.0	85.7	3.0	0.968	2.0
Butylene (C_4H_8).....	123.0	85.7	6.0	1.936	2.0
Acetylene (C_2H_2)....	240.0	92.3	2.5	0.910	1.0

Comparing the specific gravities, it will be seen that equal *weights* of ethane and propane and of ethylene and butylene respectively, yield something approaching equal photometrical values. The futility of placing any faith in carbon density is shown by comparing ethane, and acetylene, all of which are equal in this respect. Columns 2 and 5 show a gradually increasing proportion of carbon, and a gradual diminution in the proportion between the hydrogen and carbon equivalents.

But it should be remarked that acetylene has been tested under specially favorable conditions as compared with the other hydrocarbons. Referring again to the table it will be found that the first four items (which, by the way, are reproduced from my work on "The Chemistry of Illuminating Gas," p. 91) refer to experiments conducted several years ago, at a time when our knowledge as to the best way of burning rich gases was very meagre. Such gases had never been used in practice; the regenerative and incandescent systems of combustion were in their infancy; and Sugg's "London" Argand burner was the "king of the castle" in regard to all questions of illuminating value. But since that period great strides have been made. The advancement of oil gas, compressed and otherwise, has led to the manufacture of special burners; so that it is now as easy to suit 80 or 90-candle gas as 16 or 20-candle gas with the appropriate means of consuming it. The

value of ethylene, for example, was ascertained by burning it in an ordinary standard Argand. If these gases were placed on the same footing as acetylene, and consumed in small flat-flamed burners, there is every reason to believe that the results would be higher, and therefore that the advantage claimed for acetylene would not be so great.

The phometrical value of these rich gases, however, is not so important as the enriching value; and the evidence on this point is somewhat unfortunate for acetylene. It is admitted to be of no use as an enricher of water gas, which shows that either carbonic oxide or hydrogen is not a suitable diluent, or perhaps both. When applied in such small proportions as are likely to be used in actual practice, the enriching value appears to be much less than the photometrical value. With other gases, the enrichment value is found to be greater. Dr. Percy Frankland obtained an enrichment value for ethylene of some 20 per cent. more than the ascertained photometrical value; and some of the oil gases have been claimed to show a gain of 50 per cent. in this respect. This matter has usually been explained by the assumption that the burner used for consuming the gas in the pure form was not capable of doing full justice to the photometrical value of the gas.

Some further information as to the effect of diluents upon acetylene is furnished by Professor Lewes, who asserts that "all the hydrocarbons in a luminous flame are converted into acetylene before any luminosity is produced," and further on he gives the production of carbonic acid from London gas as one-fourth of that which would be evolved by the combustion of a similar bulk of acetylene. From this it appears that the London gas should yield something more than one-fifth of its bulk of acetylene, after a liberal allowance for carbonic oxide. So that the acetylene formed by the combustion of London gas, if it could be separated and used "neat," would be sufficient to yield a light of 48 candles, or threefold that actually afforded by the gas. This at once suggests the question whether acetylene is concerned in any way in the improved results afforded by regenerative and incandescent burners, which have always appeared to me to be very remarkable. The general idea of "improvement" runs in the direction of 10 or 20 per cent. When the available duty increases from threefold to fivefold, an entire change of conditions is implied.

These considerations are sufficient to show that the lecture by Professor Lewes is an important contribution to the theory of luminous combustion. I reserve for a future occasion a few remarks on the practical aspect of the question.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

SOMETHING over a fortnight ago an interruption was caused to the gas supply of Hartford, Conn., which was traceable to a singular oversight on the part of a trusted employee of the Hartford City Gas Light Company. We said the gas supply of Hartford, but in reality only a portion of the city was affected. It was well along toward midnight, and as the outlet of only one of the Company's large holders was open, the city at the particular time of course deriving its supply from such holder, the neglect of the night foreman (he has been in the Company's service for nearly 30 years) in allowing the working holder to ground before turning on the supply from a second holder was soon apparent. The natural result was the going out of a few lights in the city, but the state of affairs was discovered in a few minutes—the time between the grounding and the turning on of the supply from the second holder could not have been more than 4 minutes. The Police Department notified quite generally the owners of places of business and residences in which it was known that night lights were kept burning of the interruption of the gas supply, and no serious accident to life or property followed the night foreman's unfortunate lapse from duty. Some of the local authorities attempted to cause the shutting down of the gas supply for the night, on the plea that "in some places gas might be escaping from open burners that had not been relighted, thus causing a dangerous condition." Manager Harbison quite properly declined to accede to this request, acting on the idea that for the single one discommoded by the theory suggested by the authortties 100 would be discommoded through attempting to obtain illumination and failing to secure it in the ordinary way.

THE Gas Company of West Chester, Pa., was the victim of a fire on the 9th inst., which completely destroyed the generator house and coal sheds and stripped the gas machine of all connections. The roof of the generator house was of corrugated iron, supported on wooden posts, and the coal sheds were of wood. The fire was caused by the crude oil tank overflowing, the leaking oil running down in front of boiler. The strange feature of the case is that, although the generators and the balance of the plant were not running at the time, the oil pump was going, keeping on to the point of causing the tank to overflow. The Company's regular watchman was "quarantined" at his home for a supposed case of smallpox in his family, which afterwards turned out to be a case of measles. Only three other men were available in ordinary times, and they could not resume work on account of sickness, consequently the Company was obliged to hire a man, who, although formerly a stoker, was not familiar with the plant. The Company's Superintendent, Mr. J. J. Humphreys, Jr., immediately after the fire, secured a force of men who cleaned the debris from the building, and aided by an engineer kindly placed at his disposal by Mr. Walton Clark, and assisted by a corps of plumbers and tinsmiths, the Company was enabled to resume operations again, the gas supply of the city having been cut off for 50 hours. The generating machine is at present exposed to the weather, but the Company proposes to erect as soon as possible a building of brick and iron that will be entirely fireproof.

THE loss by the fire will amount to possibly $2,000, and those who suffered the greatest inconvenience from the temporary shutting down of the gas supply were the users of gas stoves, some 700 of which are on the Company's mains. President Worrall publicly thanked the firemen of the city for their clever work in staying the flames, which work was rendered all the more trying in that it was performed during a heavy blow of wind, with the thermometer close to the zero point.

THE annual meeting of the Lancaster (Pa.) Gas Light and Fuel Company resulted in the election of the following Board of Directors: John I. Hartman, P. T. Watt, H. D. Williamson, J. A. Coyle, J. G. Zook, J. D. Stiles, J. Fred. Sener, N. M. Woods, D. McMullen, H. M. North, H. C. Demuth, J. C. Hager, W. U. Hensel, P. B. Shaw and J. H. Baumgardner.

MR. B. J. ALLEN, formerly in charge of one of the stations of the Newark (N. J.) Gas Light Company, has been appointed Superintendent of works by the proprietors of the Brookline (Mass.) Gas Company.

THE Colorado Springs (Col.) Gas and Electric Company has completed the work of duplicating its generating plant. The total expense of making the changes is put at $25,000.

THE Northwestern Gas Light and Coke Company, of Evanston, Ills., has filed a trust deed in the Recorder's office, Chicago, for all its personal property, and a 99-year lease of its real estate to the Equitable Trust Company. The trust deed is given to secure $250,000 in gold improvement equipment bonds, and is to run for a period of 20 years, with interest at the rate of 6 per cent. The bonds are of the par value of $1,000 each, and the principal and interest are both payable in gold, in Chicago. Of the total amount $150,000 is to be used for paying off outstanding bonds and other indebtedness of the Gas Light and Coke Company.

AT the annual meeting of the Wallingford (Conn.) Gas Light Company the Directors chosen were Messrs. W. J. Leavenworth, C. H. Tibbits, L. M. Hubbard and Mrs. P. A. McClallan.

MR. JOHN C. WATSON has introduced a bill in the Nebraska Legislature to authorize cities of the class of Nebraska City, that State, to maintain and operate gas or electric light plants. The bill also provides for an officer to be known as the Light Commissioner.

THE new plate girder bridge on Laurel street, Hartford, Conn., is pronounced one of the finest pieces of work in the New England States. It consists of one span 155 feet long, with a roadway 36 feet wide in the clear. The roadbed is entirely of concrete, on buckle plates, no wood work having been used. The bridge was designed and built by the Berlin Iron Bridge Company, of East Berlin, Conn.

THE Washington (D. C.) Gas Light Company recently had the following publication made in the local papers: "Owing to the entire failure of the supply of water through the city mains at the East Station of the Company, the Company has been temporarily compelled to shut down nearly the entire plant, which may occasion inconvenience to persons living in the eastern section of the city. The Company hopes very soon to have other arrangements made to supply water, when it will be able to furnish all the gas that may be needed."

THE proprietors of the Equitable Gas and Electric Company, of Utica, N. Y., have authorized General Manager Pinkney to make the announcement that from March 1st, next, the rate for gas used for power purposes will be $1 per 1,000 cubic feet. Mr. Pinkney believes that this move is sure to meet with success, and we agree with him.

THE business offices of the Sing Sing (N. Y.) Gas Company are now located in the Dean Building, on Main street. The quarters are on the ground floor, and the spacious store front is to be devoted to the displaying of a good line of cookers, heaters, Welsbach burners, etc.

THE annual meeting of the Sarnia (Ont.) Gas and Electric Light Company was held early this month, Mr. Thomas Kenny presiding. The annual reports having been read and adopted, an election for Directors was held, with the following result: Thomas Kenny, Chas. Mackenzie, George Leys, W. B. Collins and Wm. Storey. At a meeting of the Directors the following organization was effected: President, Thos. Kenny; Manager and Secretary, William Williams.

THE water in the holder tank of the Petersburg (Va.) Gas Company was frozen fast on the night of the 8th inst., a thing that has not happened there since 1875.

A CORRESPONDENT forwards the following: "The following agreeable announcement has been made by the proprietors of the Port Jervis (N. Y.) Gas Company: 'On and after March 1, 1895, the following rates for gas, supplied through the same meter and service, will go into effect:

Quantity, per Month.	Gross Rate, per 1,000.
Less than 3,000 cubic feet	$2.10
3,000 feet and over, to 6,000 feet	1.85
For 6,000 feet and over	1.60

A discount of 10 cents per 1,000 cubic feet from the above rates will be given to customers when bills are paid before the 20th of same month the bill is rendered.' The Company is making several improvements on the plant, a very much needed addition to the apparatus being a Connelly automatic street main governor. The Company's handsome offices on King street are quite an addition to the business features of that section, and the Superintendent (Mr. John Collins) is anxious to have the residents call there, should there be anything the matter with their gas supply, so that the trouble may be traced and quieted. It is likely that considerable main laying will be gone on with at the Port this spring."

MR. H. CLAY BROWN, formerly in charge of the Carondelet Gas Light Company, Southern District of St. Louis, Mo., has resigned in order to take up business in Fort Worth, Texas. Mr. Taylor Stith is to take charge of the Carondelet plant.

THE plants of the Bristol (Tenn.) Gas, Electric Light and Power Company were sold at public auction on the 12th inst. The purchaser was the Glamorgan Iron Works, of Lynchburg, Va., which bid $20,000 for the properties.

THE proprietors of the Malden (Mass.) Electric Company have received the decision of the Board of Gas and Electric Light Commissioners in respect of their application for the right to issue new stock to the amount of $94,900, being the unissued balance of a proposed issue of $100,000, the proceeds to be applied to the payment of the Company's floating debt, which now amounts to $140,000. The Board approved the issue of new stock to the amount of $19,900 instead of $94,900; for it is admitted, the Commissioners say, that no considerable expenditure for extension or improvement is likely to be needed in the near future, and that from $30,000 to $35,000 will probably be available annually for this debt and dividend.

MR. F. P. DYSEN has petitioned the Massachusetts Legislature for legislation to regulate the price of gas so as to provide that no company shall collect a higher price from any consumer using less than 200,000 cubic feet per annum than it charges other consumers using more than that amount. Another proposition before the Massachusetts Legislature has for its object the placing of the Board of Gas and Electric Light Commissioners in the category of single member commissions. In other words the Board is to have one member, instead of three, as at present. It is not likely the plan will be endorsed, although it is said some of the Companies favor it.

DESPITE the unsettled state of affairs the past year in Brazil the quantity of gas sold by the Rio de Janeiro Gas Company in 1894 was 640,000,000 cubic feet, as compared to 613,405,000 cubic feet in 1893.

MR. F. B. WHEELER, Superintendent of the Mohawk Gas Company, which concern is the legal successor to the rights and privileges of the Schenectady (N. Y.) Gas Company, reports that the works have been reconstructed, and are now of the 10 inch type, instead of the old plan of 6-inch. The retort house is 54 feet by 40 feet, by 35 feet. The business of the Company is progressing in a satisfactory manner, no fewer than 500 Welsbach lamps having been put up in four months; and 460 of these displaced electric lamps.

THE annual meeting of the Leominster (Mass.) Gas Light Company resulted in the selection of the following officers: Directors, N. Harwood, H. M. Lane, C. Derby, G. F. Morse and G. A. Lane; President, N. Harwood; Secretary, Treasurer and Manager, H. M. Lane.

THE proprietors of the Freeport (Ills.) Gas Company have reduced the selling rate to $1.40 per 1000 cubic feet, a concession of 35 cents per 1000.

THE incorporators of the new Company for Murphysboro, Ills., which is to be known as the Murphysboro Gas Light Company, are Messrs. J. D. Peters, P. M. Post, W. C. Noonan and George E. Kirchmer. It is capitalized in $30,000.

SENATOR BALDWIN has introduced a bill in the Kansas Legislature granting to cities of the second class full authority to purchase or construct water works, electric light and gas plants for the purpose of supplying water and gas and electric light for such cities. The bill further provides that such cities may issue bonds to cover any indebtedness caused in this manner by a vote to do so at a city election, to be called by proclamation of the Mayor upon the receipt of a petition with 100 signers.

THE new proprietors of the Grand Rapids (Mich.) Gas Company have determined to retain Mr. H. D. Walbridge as the Manager of its affairs, which all will agree keeps the right man in the right place. It is proposed to erect a new gasholder at Grand Rapids, and to make important extensions to the main system.

THE Springfield (Mass.) Gas Light Company has petitioned the Selectmen of West Springfield for authority to lay its mains and pipes through the town and to do what is necessary to distribute and sell gas for lighting, heating and power purposes. A hearing on the petition will be had on March 2nd.

AT the annual meeting of the stockholders of the Portsmouth (N. H.) Gas Light Company the following Directors were elected: John Sise, Marcellus Eldredge, Wm. H. Cotton, H. Fisher Eldredge and John H. Cheever. At a subsequent meeting of the Directors the following officers were chosen: President, Marcellus Eldredge; Vice-President, H. Fisher Eldredge; Clerk and Treasurer, H. W. Waldron; Supt. Electric Department, T. F. Flanagan; Supt. Gas Department, T. R. Martin.

MARION B. MERRICKS called at the house of Mrs. S. T. Jacques, No. 15 South 13th street, St. Louis, Mo., and represented he had been sent by the Laclede Gas Company to inspect the burners, which, he said, had been reported as out of order. He went through the house and put on 4 burners, handing in a bill for $1, which was paid. Subsequently Mrs. Jacques reported the occurrence to the Gas Company and was told she had been swindled. The Company complained to the police who apprehended the offender, who was held for investigation. It is believed that this is the fellow who recently victimized several gas consumers in Cincinnati and Omaha.

WE understand that the ordinance recently passed by the Council of Danville, Ills., granting a 50-year ordinance to the Danville Gas and Fuel Company, has been signed by Mayor Sloan. The whole thing looks like a strike.

A CONSTITUTIONAL amendment offered by Senator Hart in the California Legislature provides that within 90 days after the adoption of the amendment, which declares that the use of gas and electricity for illuminating is a public use, every municipal corporation in the State must bring suit to determine the value of the gas or electric plant, and that the charges for gas or electric service must then be fixed by the municipality, so that the income derived from the corporations will not exceed 6 per cent. on the valuation thus determined.

STILL another measure relating to gas in California was brought to the notice of the lawmakers by Senator Toner, who declares that the Supervisors of San Francisco are directed to fix the price of gas in that city at $1 per 1,000 cubic feet; and that Sec. 630 of the Civil Code shall be amended as follows: "Every gas corporation is required upon application to lay service pipes to connect with the main and furnish accurate meters free of charge to the consumer. If, for the space of 10 days after the application, the corporation refuses or neglects to make such connections or to furnish such meter required, it must pay to the applicant the sum of $100 as liquidated damages, and $10 a day as liquidated damages for every day such refusal or neglect continues thereafter, which sum, together with the costs of suit, may be recovered by the party aggrieved by suit instituted in any court of competent jurisdiction in this State."

The Market for Gas Securities.

Consolidated was the feature during the week, with all the dealings on the rising side. Yesterday (Wednesday) 304 shares were sold on the Exchange at 130, and the opening price to-day was 131¼ to 132. The impression gains strength that unfavorable legislation (in other words, dollar gas) will not be pressed, although much depends on the Coffey dollar gas bill for Brooklyn. Should that measure pass it would be an impossibility to maintain a higher rate in New York City. However, no one can say positively now what the outcome is to be. Other city shares are strong save Standard common. New York and East River common shows no change, and it is reported that the Company's bonded debt is to be increased to $5,000,000. There is no change in the Brooklyn situation. Chicago is steady to strong, at 73⅜ to 73¼, and it is understood that all difficulties in respect to reorganizing the executive management have been settled. Bay State is very weak, at 15 to 15½.

Gas Stocks.

Quotations by Close & Nash, Brokers and Dealers in Gas Stocks.

35 Wall St., New York City.

February 25.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	131¾	132
Central	500,000	50	150	—
" Scrip	220,000	—	106	--
Equitable	4,000,000	100	178	180
" Bonds	1,000,000	—	107	—
Metropolitan, Bonds	658,000	—	108	112
Mutual	3,500,000	100	152	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	95	—
" Bonds	150,000	—	95	—
N. Y. & East River Gas				
Common	5,000,000	100	23	26
Preferred	2,000,000		37	—
Bonds	3,500,000	100	81½	83½
Richmond Co., S. I.	348,650	50	50	—
" Bonds	100,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	—	39
Preferred	5,000,000	100	89	91
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	120	—
Citizens	1,200,000	20	65	—
" S. F. Bonds	320,000	1000	—	101
Equity Gas Light Co	2,000,000	100	—	—
Bonds	1,000,000	—	—	—
Fulton Municipal	3,000,000	100	175	—
" Bonds	300,000		103	—
Peoples	1,000,000	10	85	—
" Bonds (7's)	368,000	—	100	—
(6's)	94,000	—	98	100
Metropolitan	870,000	100	160	—
" Bonds (5's)	70,000	—	—	155
Nassau	1,000,000	25	200	—
" Otfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	190	--
" Bonds	1,000,000	—	107	110

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As **Assistant or Superintendent of a Small Gas Works,**

by a middle-aged man having 20 years' experience in the gas business. References
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Gas Works Wanted.

Wanted, to Purchase or Lease,

A SMALL GAS PLANT,

where a good business might be worked up. Address
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The Watertown (N. Y.) Gas Light Co. will receive bids for their Coal Tar Production of 1895. Process, all coal; production, about 500 bbls. Put up in 50-gal. barrels f.o.b. cars Watertown, N. Y. Bids to be opened and contract to date from March 1, 1895. WATERTOWN GAS LIGHT CO.,
1023-tf Watertown, N. Y.

Lungren Lamps For Sale.

30 Lungren & Gordon Lamps, in first-class condition, for sale very cheap.

Information and price on application to
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1023-tf Watertown, N. Y.

Utilize Your Gas Liquor.
NO EXTRA LABOR OR OPERATING EXPENSES.

Ammonia Concentrator,

Not Expensive. Write to
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Extensions to Existing Gas Plants and Initial Plants Designed. Bids obtained, checked and tabulated, ready for Board or Committee meetings. *Work followed at the Shops to secure Proper Attention and Speed, and Inspected during Erection.*

Electrolysis Prevented

Gas Pipes and Water Pipes Protected from Corrosion of Electric Railway Currents by Patented Process.

IN USE AT NEWARK, N. J.

HAROLD P. BROWN, Electrical Expert,
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Correspondence solicited from City Officials and Managers of Gas Works, Water Works, and Electric Railways. Refers to Thomas A. Edison, Orange, N. J.; F. S. Pearson, Chief Engr. Metropolitan Traction Co., N. Y.; David Young, Gen'l Mangr. Consolidated Traction Co., Jersey City; Harrison Van Duyne, Prest. Board of Works, Newark, N. J.; Newark City Gas Co., Newark, N. J. 1023-13

Patent Lava Gas Tips.

UNIFORMITY GUARANTEED.
ALL SIZES AND SHAPES.

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CHATTANOOGA, TENN.

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SHANER GAS COAL

is the finest grade of Gas Coal mined.

Write for particulars to the

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MOSES G. WILDER,

Mechanical Engineer,

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Gas Governors,

Governor Gas-Burners,

Gas Cocks and Fittings,

In addition to a full assortment of Volumetric Governors, etc., I am now making **MERCURY PRESSURE GOVERNORS** of all the usual sizes, adapted to use upon *Gas Stoves, Furnaces, and Meters.* The same careful attention to details of design and workmanship which has established the reputation of **WILDER'S VOLUMETRIC GOVERNORS** will be given to the new line. They have been thoroughly tested in many places during the past year, and have given entire satisfaction. The price is very low, and but for a complete system of machinery adapted to this work, it would be impossible to sell them at the price. I hope for large orders, as they become known, in consequence of the low price and good quality.

If You Want the Best GAS-TIGHT Tubing,

BUY OF THE

NEW YORK GAS TUBING CO.

334 & 336 East 23d St., N. Y.

GUARANTEED NOT TO STIFFEN. **Makers of All Kinds of Flexible Tubing.**

The Celebrated SHANER GAS COAL

CORRESPONDENCE SOLICITED.

Is Mined and Shipped from the Best Gas Coal Basin in Pennsylvania.

SHANER COAL CO., - 1326 Chestnut Street, Philadelphia.

THE LITTLE GIANT (AN IMPROVEMENT ON THE LOWE) GENERATOR.

Can be put into Coal Gas Works at a price the interest on which will not be so much as their present repair account.

This Generator is now in use in nearly every State in the Union, and everyone using it will recommend it to you.

It makes a faultless gas from whatever gas-producing materials are cheapest in the locality where required, using hard coal or coke in connection with Lima crude or any other crude petroleum or its distillates, including *Naphtha of any specific gravity.*

I build these Generators with any required capacity, from 3,000 cubic feet per hour upward.

In more than one half the gas works in the country the "Little Giant" will enable *one man* to easily make, in *five hours*, all the gas needed for the *twenty-four hours.*

Why struggle day and night, year after year, with high priced, low candle Coal Gas; with choked standpipes, broken retorts, naphthaline, and interminable other troubles and delays, while it is so easy to make an entirely better gas for less money in a quarter of the time, and having none of these drawbacks?

If gas coal is very cheap and anthracite coal and hard coke very expensive with you, put in a Little Giant Generator, as many others have done, *to increase candle power, to use up your surplus coke, and to rush up your holder when hard pressed.*

All work and results guaranteed.

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THE HAZELTON OR PORCUPINE BOILER.

Is Superior to All Others in

Economy, Safety, Durability,
Efficiency, Capacity,
Quality of Steam Produced,
Combustion of Fuel,
Accessibility for Internal and
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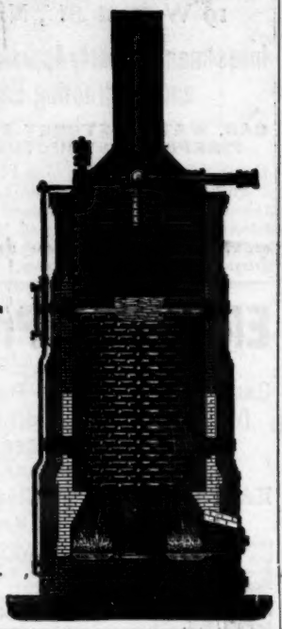

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HYDRATED OXIDE OF IRON
For Gas Purification.

Analysis, Samples and Particulars on Application.

THE CHEMISTRY OF ILLUMINATING GAS.
By NORTON H. HUMPHRYS. Price, $2.40.
Orders may be sent to
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AIR COMPRESSORS
For Compressing Gases, Testing Purposes, Operating Oil Burners under Furnaces, and every other Purpose.
COAL TAR PUMPS.
Send for Catalogue.
CLAYTON AIR COMPRESSOR WORKS,
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RELIABLE GAS STOVES AND RANGES

By all odds the most Complete Line manufactured under one name, comprising all known Styles and Sizes.

More desirable improvements made in the **Reliable** line for 1895 than in all makes combined for the past ten years.

In addition to the many improvements, we have also added a complete new line of

High Grade Ranges,

swelling the **Reliable** line for 1895 to six distinct and separate lines of Ranges and three lines of Hot Plates, making in all

126 Sizes and 252 Styles, Ranging in Price form $2 to $84.

All the valuable improvements we have added for the coming season will give the **"Reliable"** a prestige as the leading line of Gas Ranges, and, being such a good thing, will undoubtedly be pushed along by others in 1896.

You will always find the **Reliable** line at least three years in advance of all competitors.

THE SCHNEIDER & TRENKAMP COMPANY, Sole Manufacturers,
Cleveland, O., and Chicago, Ill.

Send for our 1895 Gas Catalogue. It cannot fail to interest you.

JEWEL GAS RADIATORS.

The Perfect Room Heaters.

If these Radiators were simply a duplication of what has been done, they would be worth but a passing notice.

One Continuous Tube
Instead of a Single Tube Construction.
This gives greater burner capacity

Central Draught Tubes.
This permits chimney connection, without extra cost in fuel.

All Parts Near Burners are Cast Iron.
All Outside Upper Tube Casings are Enameled.

—SEND FOR CATALOG.—

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WILLIAM M. CRANE & CO.,

Office, 838 Broadway.
Factory, 428 & 430 W. 14th Street, New York City.

Patented Nov. 28, 1893.

Use the

* EUREKA * CONNECTION *

In Setting Your Meters.

AN ABSOLUTE GAS-TIGHT JOINT. NO SOLDER OR FURNACE REQUIRED.

SAVES TIME AND MONEY.

Now in use by a large number of Gas Companies. It will pay to investigate this Device.

The object of this pipe coupling is to produce a joint by which the lead pipe used in setting meters is flanged and connected from service to meter and meter to house riser without the use of solder.

Its Advantages.—Absolutely gas and water tight; dispenses with solder, coppers, furnace, etc.; requires fewer fittings in connection; effects a saving of one size in lead pipe; reduces the cost of labor to a minimum; produces a perfect and workmanlike joint; does away with all washers; shop room can be curtailed or abolished; adapted to any style of cock on the market. Saves in material alone 65 per cent.

In addition to the advantages stated, the full area of the pipe can be maintained—a feature often lacking where the swivel is inserted too deeply into the side of the lead pipe, thereby materially diminishing the flow of gas. Letters Patent bearing date of Nov. 28, 1893, have been granted covering this invention, and we are now prepared to sell to Gas Companies fittings and tools as per price list. The Eureka connection is being used by a number of the largest Gas Companies in the United States, from whom testimonials have been obtained.

With the view of your adopting this device, we would be pleased to have you send us a sample order—say for 25 meters.

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Gas Controllers, Meter and Service Cocks, Independent and Hose Cocks, and Fittings of all kinds, with Extra Large Gas Way.

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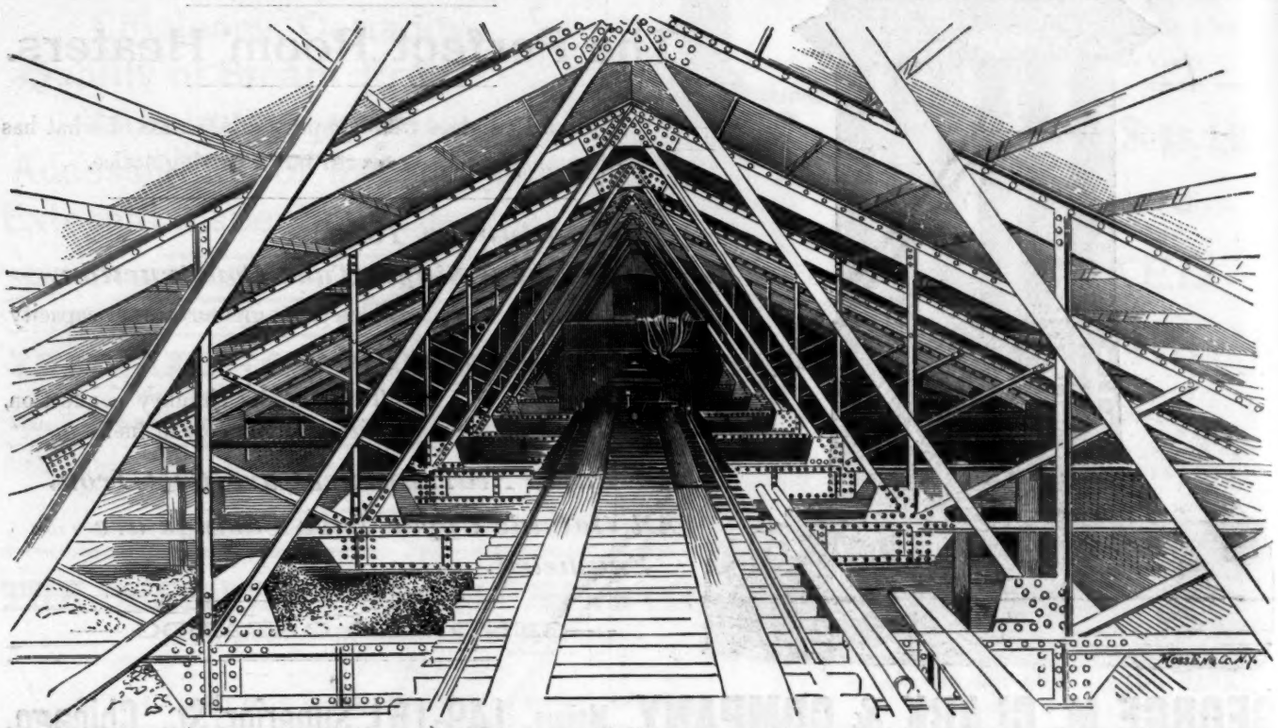

The above illustration is taken direct from a photograph, and shows an Iron Truss Roof designed and built by us for the Burlington City Water Works, at Burlington, Vt. The building is used for storing coal, and the roof is designed to carry a track through the trusses, so that the coal can be distributed from the car, and thus save handling. The roof is entirely of iron, no woodwork being used about it in any way, shape or manner, so that it is absolutely fireproof.

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WATER GAS PLANT A SPECIALTY.
GAS PROPERTIES EXAMINED AND VALUED.
ADVICE AS TO IMPROVEMENT OF GAS PROPERTIES AND MANAGEMENT.

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Price $1.

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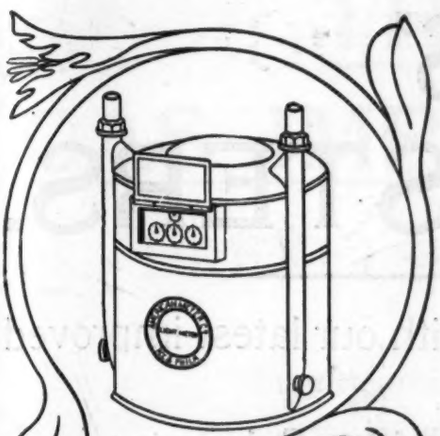

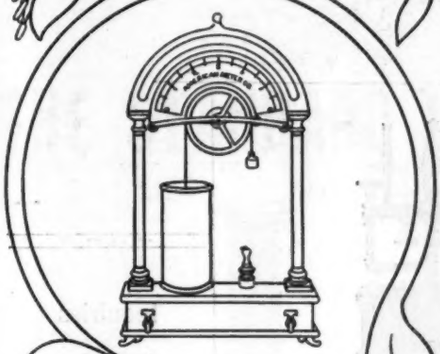

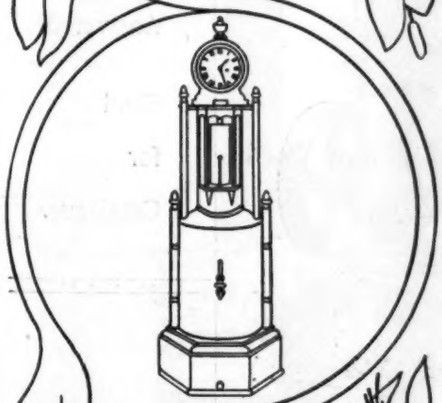

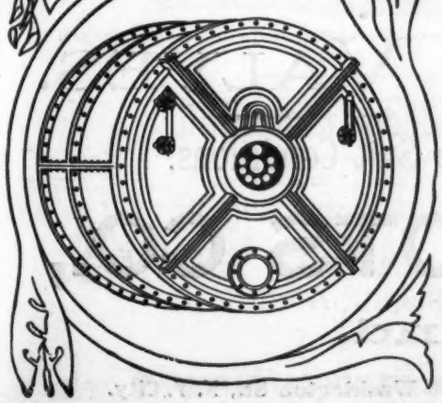

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NEW YORK AND PHILADELPHIA,

CHICAGO, ST LOUIS,

SAN FRANCISCO.

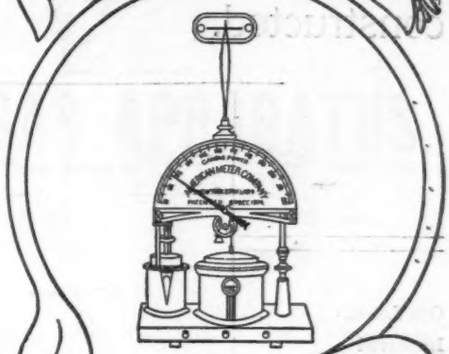
PUBLIC LIGHTING TABLE.

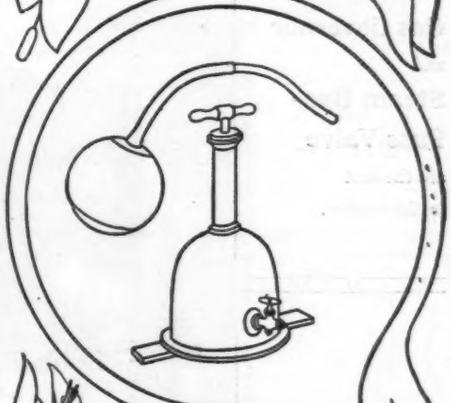
MARCH, 1895.

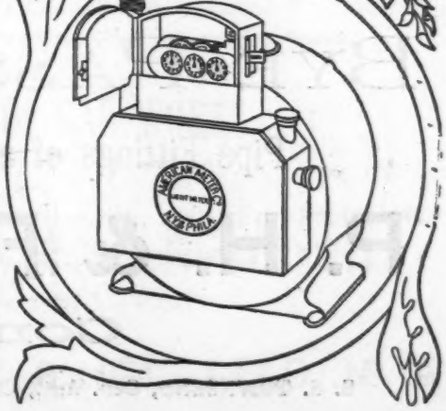
Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Fri.	1	10.10 PM	5.40 AM	5.30	5.45
Sat.	2	11.20	5.40	5.30	5.45
Sun.	3	12.20 AM	5.30	5.30	5.45
Mon.	4	1.30 FQ	5.30	5.30	5.45
Tue.	5	2.30	5.30	5.40	5.35
Wed.	6	3.20	5.30	5.40	5.35
Thu.	7	4.00	5.30	5.40	5.35
Fri.	8	4.40	5.30	5.40	5.35
Sat.	9	No L.	No L.	5.40	5.35
Sun.	10	No L. FM	No L.	5.40	5.35
Mon.	11	No L.	No L.	5.40	5.35
Tue.	12	6.40 PM	9.10 PM	5.50	5.20
Wed.	13	6.40	10.30	5.50	5.20
Thu.	14	6.40	11.40	5.50	5.20
Fri.	15	6.40	12.50 AM	5.50	5.20
Sat.	16	6.40	2.00	5.50	5.20
Sun.	17	6.40 LQ	3.00	5.50	5.20
Mon.	18	6.40	3.50	5.50	5.20
Tue.	19	6.40	4.30	6.00	5.10
Wed.	20	6.40	5.00	6.00	5.10
Thu.	21	6.40	5.00	6.00	5.10
Fri.	22	6.40	5.00	6.00	5.10
Sat.	23	6.40	5.00	6.00	5.10
Sun.	24	6.50	4.50	6.00	5.10
Mon.	25	6.50 NM	4.50	6.00	5.10
Tue.	26	6.50	4.50	6.10	4.55
Wed.	27	6.50	4.50	6.10	4.55
Thu.	28	6.50	4.50	6.10	4.55
Fri.	29	6.50	4.50	6.10	4.55
Sat.	30	10.20	4.50	6.10	4.55
Sun.	31	11.20	4.40	6.10	4.55

TOTAL HOURS LIGHTING DURING 1895.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	237.00	January	423.20
February	196.40	February	355.25
March	195.50	March	355.35
April	165.30	April	298.50
May	153.40	May	264.50
June	138.20	June	234.25
July	146.30	July	243.45
August	152.50	August	280.25
September	165.10	September	321.15
October	186.10	October	374.30
November	204.10	November	401.40
December	219.30	December	433.45
Total, yr.	2161.20	Total, yr.	3987.45





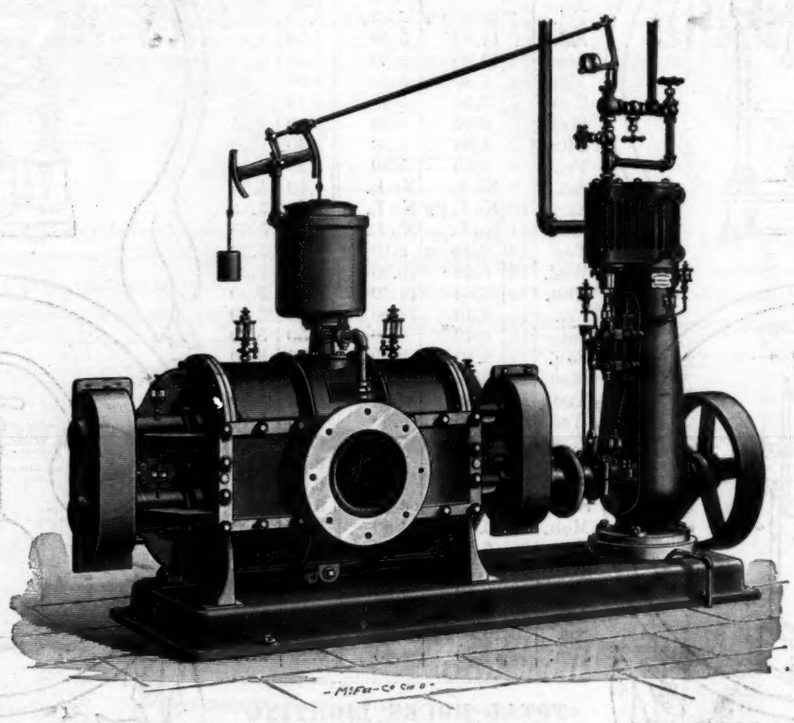


ROOTS' GAS EXHAUSTERS.

We take pleasure in illustrating herewith our latest improved Gas Exhauster.

It is without question the most perfect Exhauster ever constructed.

Our Latest Improved **Automatic Gas Governor** and **Steam Bye-Pass Valve** are the best in the market.



Inquiries Cheerfully Answered.

Send for Catalogue.

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Pipe Fittings of all Kinds and Designs to Suit Conditions.

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Connersville, Ind.

S. S. TOWNSEND, Gen. Agt., COOKE & CO., Selling Agts., 163-165 Washington St., N. Y. City.

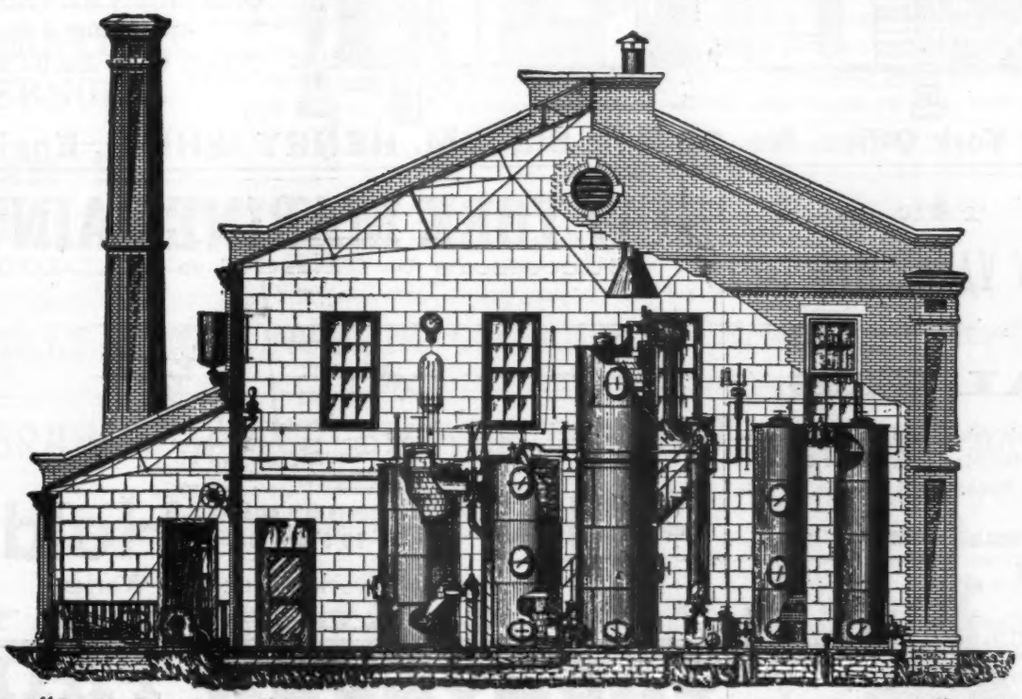
THE UNITED GAS IMPROVEMENT CO.,

DREXEL BUILDING, PHILA., PA.

Inquiries from any part of the United States should be addressed to the Philadelphia Office.

BUILDERS OF

THE STANDARD LOWE WATER GAS APPARATUS.



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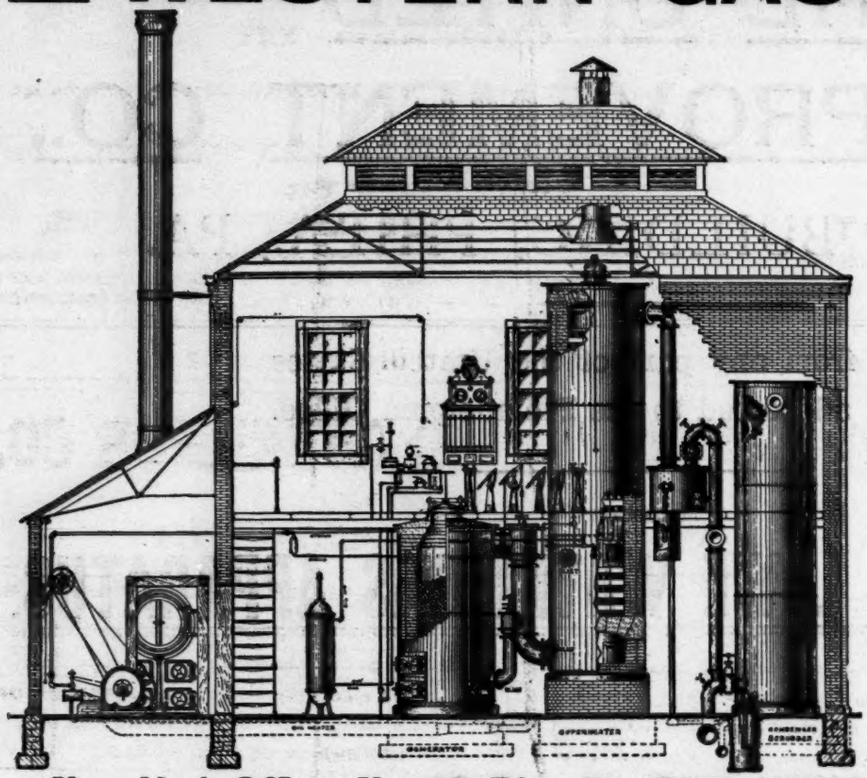
Water Gas Plants, either independent or auxiliary to Coal Gas Works, erected to meet any conditions. Apparatus designed to use any grade of Oil, and Anthracite Coal, or Gas House or Oven Coke.

PAMPHLETS, PLANS AND ESTIMATES FURNISHED UPON APPLICATION.

THE WESTERN GAS CONSTRUCTION CO.



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IMPROVED LOWE WATER GAS Apparatus.

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Hydraulic Main Dip Regulators, Check Valves, Foot Valves, Yard Wash and Fire Hydrants.

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Builder and Operator of Gas Works.

SOLE OWNER OF THE

REW APPARATUS,

FOR THE MANUFACTURE OF CARBURETED WATER GAS DIRECTLY FROM LOW GRADE SOFT COAL AND CRUDE OIL AND NAPHTHA.
A DEMONSTRATED SUCCESS.

SOLE OWNER OF THE

MORRELL APPARATUS,

FOR THE MANUFACTURE OF CARBURETED WATER GAS FROM HARD COAL OR COKE AND CRUDE OIL OR NAPHTHA. A WELL-KNOWN TYPE, SIMPLE, ECONOMICAL AND EFFICIENT.

PLANS AND GUARANTEED ESTIMATES FURNISHED UPON APPLICATION.

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AUTOMATIC GOVERNOR. OVER FOUR HUNDRED NOW IN USE! NO WORKS COMPLETE WITHOUT IT! WILL PAY FOR ITSELF WITHIN A YEAR! ITS SERVICE SECURES PERFECT DISTRIBUTION, REDUCES LEAKAGE TO MINIMUM, and BENEFITS THE COMPANY and CONSUMER ALIKE! IT IS THE ONLY RECOGNIZED AUTOMATIC GOVERNOR IN THE WORLD!

STEAM JET EXHAUSTER. Designed particularly for small works. Combines Exhaust Tube, Steam Governor, Gas Compensator and Bye-Pass Valves in the most compact form possible. Occupies but little space; uses very little steam; saves formation of carbon in retorts; increases yield 10 to 15 per cent. No works too small to use them profitably.

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Successors to WILBRAHAM BROS.,

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Wilbraham Gas Exhausters,

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And Rotary Piston Pumps.

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Acts immediately, and more efficiently than any other purifying agent now in use.

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Is a superior natural Hydrated Oxide of Iron. Will give a higher purification per bushel than any other material. We ship the pure Oxide of Iron, containing no sawdust, thus effecting a saving in freight, leaving the consumer to furnish the diluent at a nominal cost. It is now used by the largest gas companies in the West

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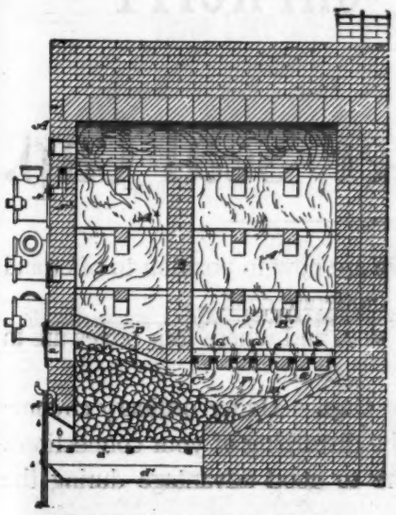

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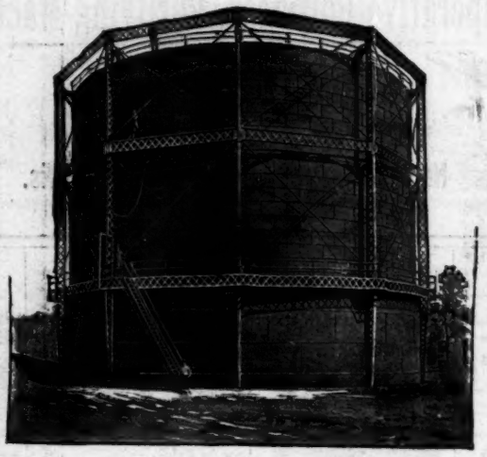

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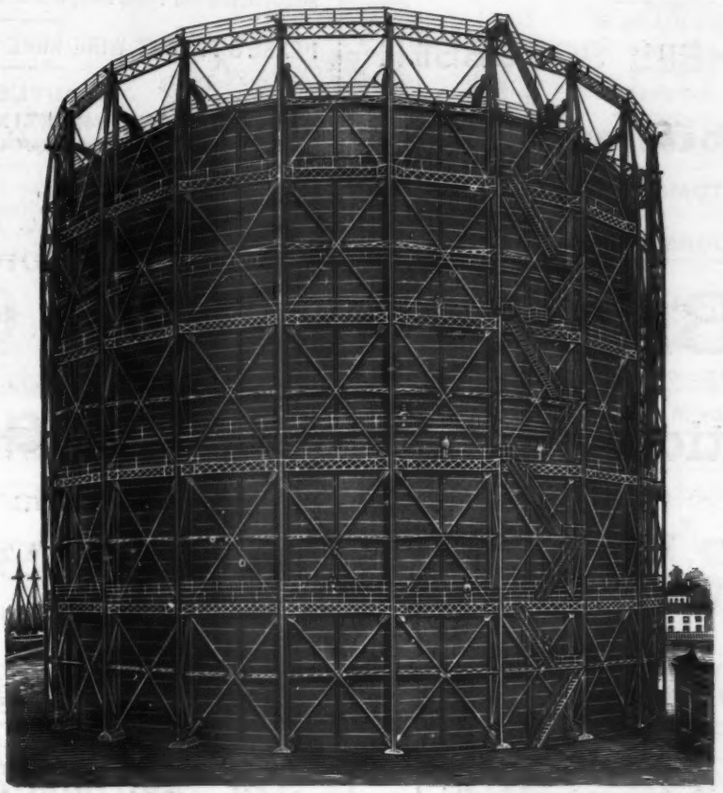

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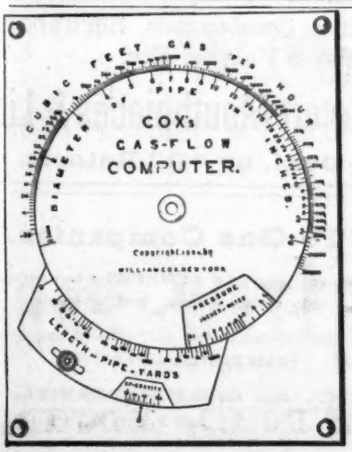

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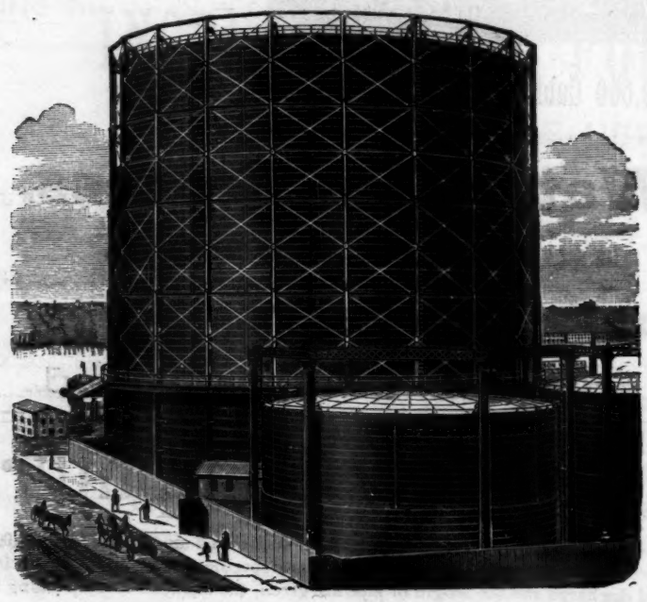

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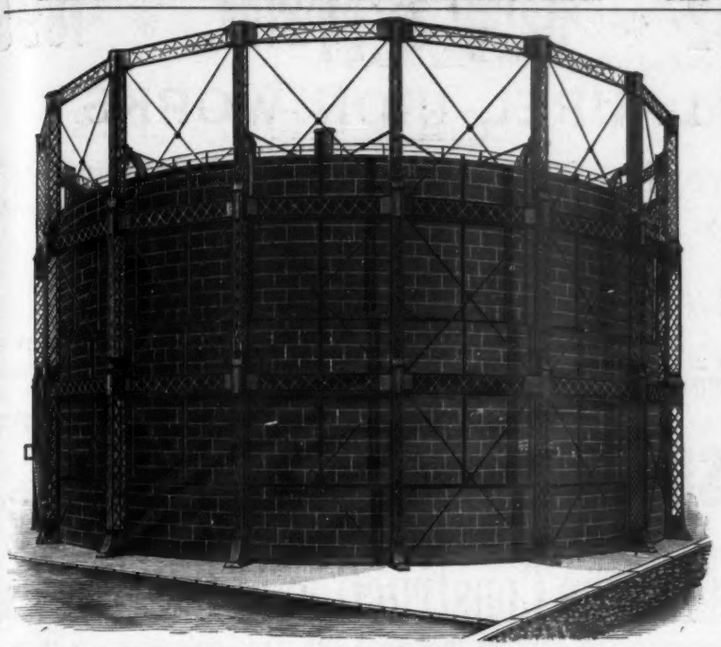

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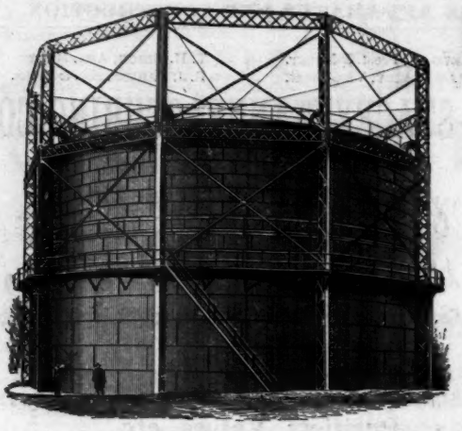

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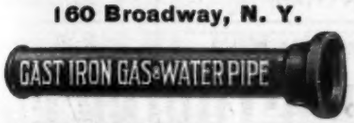

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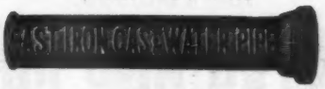

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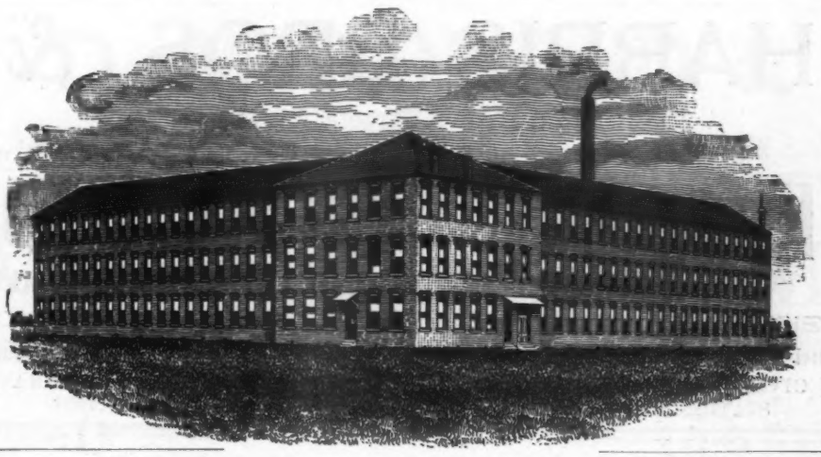

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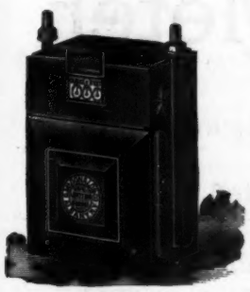

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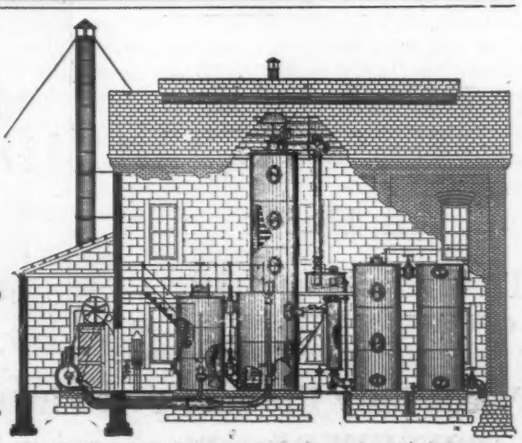

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